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VI. Observations on the diurnal changes in the position of the horizontal needle, under a reduced directive power, at Port Bowen, 1825. By Lieutenant HENRY FOSTER, R. N. F. R. S. Communicated January 12, 1826.

THE daily variation of the horizontal needle is a subject which has, for nearly a century, attracted the attention of several accurate observers, whose object was principally limited to determining the hour of the day, when its amount was the greatest, and the times of the needle's successive easterly and westerly motions.

From these observations, however, it could not be ascertained whether the cause of this daily variation proceeded from an actual change in the direction of the magnetic axis of the earth, or whether it arose from some foreign force, acting transversely on the needle, impelling it out of its natural direction. To submit this question to the test of observation, Mr. BARLOW, in 1823, undertook a set of experiments on the daily variation of a horizontal needle nearly neutralized by the application of artificial magnets; under an idea, that if the daily variation proceeded from an actual change in the direction of the earth's magnetism, the needle in this case, as when in its natural state, would merely take up its new direction without any increase of amount; but if it proceeded from a foreign force acting transversely upon it, the needle now having less intensity of direction than when in its natural state, it would yield more easily to this transverse force and give a larger expression, which would

serve to mark with more precision than heretofore, all the circumstances of this daily change. On trial, the amount was found to be very considerably increased ; and he, still in pursuit of the same object, now undertook to ascertain the direction which the daily variation impressed upon the needle, when balanced at different azimuths ; which was easily done by a slight adjustment of the magnets ; and in this way he found that in two positions of the needle, *viz.* when its north end was directed either to N 16° W, or S 16° E, no daily variation, or a very little took place, and that on one side of this line, the needle passed in one direction, and on the other side in an opposite one.

In the memoir which the Author published relative to these experiments, he expresses a wish that some other persons would pursue this enquiry ; and as the parts in which we were likely to winter in the recent voyage of discovery under Captain PARRY, seemed highly favourable for the purpose, I determined to avail myself of this circumstance, and to make a regular set of such observations.

With respect to the daily variation, it was soon found, as was expected, that the needle being nearly neutralized by the great amount of dip, no artificial means would be necessary for increasing its amount : all the observations, therefore, on this head, were made with the needles suspended in their natural state, and the following are entirely devoted to the second object, *viz.* of determining the direction which the needle takes in consequence of the daily variation when directed to different points of the compass, and to ascertain the line of no daily variation, or at least that line in which the motion is a minimum.

Mr. CHRISTIE, in pursuing the experiments above referred to, and in those on the effects of temperature on magnets, had made use of an instrument admirably suited to such purpose ; and he very obligingly superintended the construction of one somewhat similar for my use ; a description and drawing of which he has given in his paper on the effects of temperature on magnets, published in the Phil. Trans. for 1825.

In these experiments, the apparatus was frozen to three firm stone supports, erected in a house built of snow, having the top covered with canvas ; the zero on the compass-box was made to coincide with the direction of the needle at 6^h A.M., that being, although somewhat arbitrarily considered (from the mean of the preceding month's observations on the daily variation), the magnetic meridian. The needle used was made of clock spring, very delicate and light, in length 4,5 inches, its greatest breadth at the centre was 0,45 inches, and its extremities terminated in sharp points ; the pivot on which it rested was also repolished previous to the commencement of the observations.

Having considerably reduced the directive power of this needle in its natural direction, by the action of two bar magnets, placed in the magnetic meridian, and in the same horizontal plane with it ; I began on the 14th of February to register the amount of the daily change at stated intervals throughout the twenty-four hours, the Officers of the ship kindly assisting me, by taking the observations at the times of my attendance to other duties. The states of the two thermometers placed upon the instrument, were also noted at the time of every observation ; and to preserve the intensity of the magnets from being affected by any sudden change

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of temperature, produced by the approach of the observer, or other causes, they were thickly covered with snow after every adjustment.

During that part of the day when the needles suspended with floss silk indicated westerly variation, the direction of this needle is marked towards the *right hand*, when the *north end passes to the right hand of a person standing outside of the compass-box, and facing the north end of the needle*; and to the *left, when it passes towards the left hand*.

In the following details is given a short description of the adjustment of the magnets to the needle, at the commencement of the observations in each position of its north end; and also the time in which it performed one vibration when under their influence, as well as the ratios in which the directive force was reduced by them; but it must be remembered, that these ratios are mere approximations, since the directive force was always so much diminished, that a sufficient number of vibrations could not be counted, to estimate the duration of one with the required exactness. In the annexed tables every phenomena, such as halos, aurora borealis, winds, state of the weather, and position of the moon, are inserted; together with such remarks, as suggested themselves at the time of observation. There is also inserted in italics in the column of remarks; max. easterly and westerly variation, opposite the hours at which they respectively took place by the suspended needle No. 2, in order to define the time of the day when the motion of this needle was towards the right, or left hand, as above described. And to point out the times of maximum westerly and easterly deflections of this needle, the signs + and — are prefixed to the hours of observation when they respectively happened.

North end of Needle to the North.

The magnets being placed to the north and south of the needle, with their axes coinciding with the magnetic meridian, the north magnet had its north pole, and the south magnet its south pole, directed towards the needle, at the distance of 31.5 inches from the centre of the compass-box. In this position of the magnets, the needle made one vibration in 15 seconds, so that the directive force was reduced in the ratio of 0.14 to 1 nearly.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825.									
Feb. 14th	h. m.								
	0 30	A. M.	N 3 20 E	—19	.....	m. s.	Calm	Hazy	Aurora faint.
	1 00		4 50	—19	.....	.....	.....	.....	Aurora not vis.
	—2 00		5 00	—19	.....	.....	.....	.....	Max. easterly variation.
	2 25		5 00	—19	—	—	—	—	
	6 35		5 00	—20	.....	—	—	—
	6 40		4 30	—20	—	—	—	—	
	6 45		3 40	—20	—	—	—	—	
	7 00		1 30	—20	.....	—	—	—
	7 42		North	—20	—	—	—	—	
	7 52		N 3 00 W	—20	—	—	—	—	
	10 00		4 30	—20	—	—	—	—	
	10 10		5 30	—20	—	—	—	—	
	11 00		8 00	—20	—	—	—	—	
	11 17		8 20	—20	—	—	—	—	
	11 32		8 20	—20	—	—	—	—	
	11 47		8 40	—20	—	—	—	—	
	Noon		8 40	—20	—	—	—	—	
	0 32	P. M.	9 00	—20	—	—	—	—	
	0 35		10 00	—20	—	—	—	—	
	0 37		10 30	—20	—	—	—	—	
	0 40		10 55	—20	—	—	—	—	
	+ 0 42		11 00	—20	—	—	—	—	
	1 5		11 00	—20	—	—	—	—	
	1 23		11 00	—21	—	—	—	—	
	2 00		11 00	—21	—	—	—	—	
	2 20		11 00	—21	—	—	—	—	
	2 32		10 30	—21	—	—	—	—	
	2 45		10 00	—21	—	—	—	—	
	8 10		—	—	—	—	—	—	
	8 20		N 2 5 E	—21	—	—	—	—	
	9 33		2 50	—23	—	—	—	—	
	10 35		8 50	—22 ¹ ₂	—	—	—	—	
	10 37		10 20	—22 ¹ ₂	—	—	—	—	
	10 52		10 40	—23	—	—	—	—	
	11 2		10 10	—23	—	—	—	—	
	11 30		10 10	—23	—	—	—	—	
	11 52		10 00	—23	—	—	—	—	

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North End of Needle to the North.

Date.	Mean Time of Observ- ation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrent. — Instr.	Direction of north end of needle during westerly daily variation.	Time that a ho- rizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 15th	h. m.	A. M.	° ,	°	m. s.		NNW	Hazy	
	0 22		N 10 00 E	—24					
	1 00		10 00	—26					
	1 50		10 00	—26					
	2 00		12 5	—26					
	2 10		13 20	—26					
	2 16		13 30	—26					
	2 30		13 30	—26					
	6 55		North	—24					
	7 00		N 3 00 W	—24					
	7 5		6 00	—24					
	7 10		8 20	—24					
	7 12		11 00	—24					
	+ 7 15		12 00	—24					
	10 7		10 50	—24	To the right hand.	18 5,2			Max. westerly variation.
	10 35		10 30	—24					
	11 00		10 00	—24					
	11 10		9 30	—24					
	11 30		9 30	—24					
	11 50		9 30	—24					
	11 55		10 00	—24					
	0 10		10 00	—23					
	0 30		10 20	—23					
	1 00		10 20	—23					
	1 10		10 20	—23					
	1 30		10 30	—23					
	1 57		10 00	—25					
	2 10		9 30	—25					
	2 35		9 00	—26					
	3 00		8 30	—26					
Feb. 16th	7 50	P. M.	4 00	—26					
	8 00		2 30	—25					
	9 00		1 40	—25					
	9 2		N 0 30 E	—25					
	9 37		2 20	—25					
	10 17		2 30	—25					
	11 36		3 10	—25					
	Midn ^t		3 30	—25					
	0 45		11 00	—25					
	0 50		11 40	—25					
	0 57		12 15	—25					
	1 00		13 5	—25					
	1 3		13 30	—25					
	1 7		13 40	—25					
	+ 1 10		13 50	—25					
	1 25		13 00	—25					
	1 30		12 00	—25					
									Max. easterly variation.

The north end of the needle was now directed to the south; but as observations were afterwards made with the north end of the needle to the north, they are given in this place, to preserve uniformity in the arrangement.

North end of Needle to the North.

At this time the magnets placed north and south of the needle, had their axes inclined to the magnetic meridian at an angle of 22 degrees, and the distance of their nearest ends from the centre of the needle was 32,95 inches. The time in which the needle now performed one vibration, was 10,24 seconds, and the directive force reduced in the ratio of 0,325 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Apr. 15th	h. m.								
	1 20	A. M.	N 2 30 E	0 —10	.....	m. s. 18 7,8	NE by N	Squally hazy low down	
	1 30		2 40	—10					
	1 50		2 40	—10					
	2 15		2 00	—10		18 11,8			
	3 00		N 0 30 W	—10 $\frac{1}{2}$	.....	18 11,9			
	4 00		1 20	—11		18 10,5			
	5 10		4 00	—11		18 0,8			
	6 00		4 30	—12		18 0,4			
	6 50		8 20	—12					
	6 51		8 30	—12		17 55			
	8 00		9 30	—11		18 2,8			
	9 4		9 30	—11		17 59			
	10 5		9 50	—9		18 4,8			
	11 00		10 20	—7	To the right hand.	18 0,5			
	+ Noon		10 40	—7		17 42,7	NE mod.		
	0 30	P. M.	8 00	—5		17 47,5	Hazy with drift		
	1 00		6 30	—5					
	1 30		6 30	—5					
	2 00		2 10	—5		17 52			
	2 30		2 10	—5					
	2 45		5 00	—5					
	3 00		5 10	—5		18 1,2	Max. easterly var.		
	4 30		9 00	—6		18 11	Squally with drift		
	5 5		9 50	—7		18 8,5			
	+ 5 55		10 20	—8		18 8,2			
	6 55		9 10	—8					
	6 57		8 40	—8		18 7,5			
	7 52		8 25	—9		18 0,4	Lt. breeze from N.		
	9 7		8 00	—9		18 8,7			
	10 5		7 20	—10		18 8,5			
	11 4	Midn ^t	6 50	—10		18 10,5	Fine wea.		
Apr. 16th	5 10	A. M.	N 8 50 W	—11	.....	18 9,3			
	6 00		5 40	—10		18 7,7	Easterly light	Clear and fine	
	6 20		7 30	—9 $\frac{1}{2}$		18 39,1			
	7 00		10 10	—8 $\frac{1}{2}$		18 30,6			
	8 00		10 40	—6 $\frac{1}{2}$		18 31,2			
	9 15		10 25	—2		18 52			
	10 10		12 00	—1		18 25,6			
	+ 10 15		12 5	—1					
	10 30		12 5	—1					
	11 10		9 30	—1		18 16,8			
	11 32		9 20	—1					
	0 58	P. M.	7 40	—2					
	1 25		7 10	—4					
	1 30		6 30	—4					
	1 57		6 10	—4 $\frac{1}{2}$					
	3 00		3 20	—5					
	4 00		3 30	—5					
	5 15		7 10	—3 $\frac{1}{2}$	.....	18 24,4			

North end of Needle to the North.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.			
							Winds.	Weather.	Remarks, &c.
1825. Apr. 16th	6 00	P. M.	N 7 10 W	0 + 2½	m. s. 18 19,6	Calm	Clear and fine	Max. easterly variation.
	7 00		7 10	Zero	.....	18 19,3		
	8 00		6 50	— 1	.....	18 17,5		
	9 00		5 40	— 3	.....	18 20,9		
	9 30		5 30	— 4	.....	18 33,5		
	10 10		5 30	— 4	.....	18 37		
	10 30		5 30	— 4½	.....	18 36,7		
	11 10		3 5	— 4½	.....	18 40,7		
	11 55		3 00	— 5	.....	18 43,3		
	1 5		3 30	— 6	.....	18 44,2		
	2 7		4 10	— 6	.....	18 54,2		
Apr. 17th	2 52		4 30	— 7	.....	18 27,5		
	3 10		5 20	— 7	18 39	Easterly light	Max. westerly variation.	Max. easterly variation.
	4 5		7 30	— 7	.....	18 44,5		
	5 0		8 20	— 7	.....	18 49,5		
	5 30		6 20	— 6	.....	18 37,5		
	6 00		7 30	— 6	.....	18 37,5		
	6 30		8 00	— 5	.....	18 39		
	7 00		8 30	— 5	.....	18 44,5		
	7 30		8 40	— 5	.....	18 49,5		
	9 00		8 40	+ 0½	.....	18 37,5		
	9 40		11 30	+ 2	.....	18 37,5		
	10 00		12 30	+ 3	.....	18 37,5		
+ Noon	10 30		13 30	+ 3½	.....	18 37,5		
	11 00		13 30	+ 4	.....	18 37,5		
	11 30		15 20	+ 6	.....	18 37,5		
	1 5	P. M.	17 30	+ 6½	.....	18 37,5		
	1 30		12 50	+ 7	.....	18 37,5		
	2 2		8 00	+ 7	.....	18 37,5		
	9 30		5 00	+ 6	.....	18 37,5		
	10 00		7 00	— 3½	.....	18 32,0		
	10 30		6 10	— 3	.....	18 23,5		
	11 00		6 00	— 4	.....	18 20,0		
	11 30		5 40	— 5	18 46,0	Calm	Clear fine weather.	Max. easterly variation.
	Midn ^t		4 30	— 5	.....	18 46,0		
			North	— 5	18 46,0			

North end of Needle to the South.

In this case, the adjustment of the magnets was the same as in the preceding observations on the 14th of February, with this exception, viz. that their ends nearest to the needle were 27 inches from the centre of the compass-box; the needle under these circumstances making 1 vibration in 14 seconds, and the directive force reduced in the ratio of 0.154 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 17th	h. m.	A. M.	° 20	5 20 E	° 22	.....	m. s.	.....	Max. easterly variation.
	0 45		5 40	5 40	° 22	.....	17 52,5	.....
	1 00		5 40	5 40	° 22	.....	17 56,4	.....
	4 40		5 40	5 40	° 22	.....	17 59,5	.....
	5 50		5 40	5 40	° 23	.....	17 55	.....
	6 15		5 40	5 40	° 23	.....	17 54,3	.....
	7 40		5 40	5 40	° 22	.....	17 52	Calm	Hazy weather
	9 00		5 40	5 40	° 22	.....	17 50,5	.....
	9 37		5 30	5 30	° 21	.....	18 1	.....
	10 7		5 30	5 30	° 21	.....	17 57,8	North Light	
	10 30		5 30	5 30	° 21	.....	17 51,7	.....	Max. westerly variation.
	11 10		5 30	5 30	° 21	.....	17 47,2	.....
	11 20		5 20	5 20	° 21	.....	17 51,4	.....
	Noon.		3 40	3 40	° 21	.....	17 50	.....
	0 45	P. M.	3 20	3 20	° 21	.....	17 47,3	.....
	1 20		3 00	3 00	° 21	.....	17 50	.....
	1 30		2 00	2 00	° 21	.....	17 52,5	.....
	1 40		0 50	0 50	° 21	.....	17 56,4	.....
	1 45		0 40	0 40	° 20	.....	17 59,5	.....
	2 00		0 20	0 20	° 20	.....	17 55	.....
	2 12		South	2 12	° 20	.....	17 54,3	.....
	2 30		S 0 20 W	2 30	° 20	.....	17 52	.....
	2 45		0 40	0 40	° 20	.....	17 50,5	.....
	+ 3 00		1 00	1 00	° 20	.....	17 50,8	North Fresh	Hazy to the eastward
	3 5		1 00	1 00	° 20	.....	17 51,4	.....	Clear over head and to the westward
	3 20		1 00	1 00	° 20	.....	17 50	.....
	4 12		0 50	0 50	° 20	.....	17 47,2	.....
	6 00		0 40	0 40	° 21	.....	17 51,4	.....
	7 35		0 40	0 40	° 21	.....	17 50	.....
	8 10		S 1 40 E	2 30	° 22	.....	17 47,3	.....
	8 30		2 30	2 30	° 21	.....	17 50	.....
	9 00		2 50	2 50	° 21	.....	17 52,5	.....
	9 30		3 00	3 00	° 22	.....	17 56,4	.....
	9 50		4 10	4 10	° 22	.....	17 59,5	.....
	10 00		6 00	6 00	° 22	.....	17 55	.....
	10 10		6 20	6 20	° 22	17 54,3	
	10 30		6 20	6 20	° 22	17 52,5	
	11 00		6 40	6 40	° 22	17 50	
	11 30		Midn ^t	6 40	° 22	17 56,4	

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North end of Needle to the South.										
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.	
1825. Feb. 18th	h. m.			°						
	0 15	A. M.	S 6 40 E	—22	.....	m. s.		NNE Light	Clear	
	0 18		7 10	—22		.....			
	0 30		8 20	—22						
	0 40		8 40	—22						
	0 55		9 20	—22						
	1 00		9 50	—22	.....	.....		NNE Light	Clear	
	1 5		10 00	—22	.....	17 55,9			.....
	1 15		10 15	—22						
	—1 25		10 30	—22						
	1 35		10 40	—22						
	1 55		10 30	—22	.....	17 57,3				
	2 30		10 30	—22						
	3 00		10 00	—21 $\frac{1}{2}$	.....	17 56,8				
	3 30		9 40	—22						
	3 56		9 40	—22	.....	17 58,8				
	5 00		9 40	—22	.....	18 4,2				
	6 2		8 40	—22	.....	18 4,3				
	7 12		8 40	—22	.....	18 2,0				
	8 8		8 35	—23	.....	17 59,3				
	9 30		7 50	—23	.....	18 00,0				
	10 00		7 00	—23	.....	17 52,2				
	10 35		6 10	—23						
	11 5		5 30	—23	.....	17 49,6				
	11 30		5 20	—23	.....				
	Noon.		5 10	—23	.....	17 49,2				
+ 0 30	P. M.		5 00	—23	.....	.....			.....
	1 00		5 10	—23	.....	17 50,5			.....
	1 30		5 10	—23						
	2 00		5 10	—23	.....	17 52,5				
	2 30		5 10	—23	.....				
	— 3 00		5 20	—23	.....	17 54,5				
	8 50		5 10	—24 $\frac{1}{2}$	.....				
	9 30		5 10	—25	.....	17 53,2				
	10 00		5 10	—25	.....	17 56				
	10 30		5 10	—24	.....				
Feb. 19th	11 00		5 00	—25 $\frac{1}{2}$	.....	17 54,8				
	11 30		5 00	—25	.....				
	Mid ^l .		5 00	—25	.....	17 54,2				
	0 30	A. M.	5 00	—25	.....	18				
	1 00		4 40	—25	.....	18 1,5				
	1 30		4 40	—25						
	1 55		4 40	—25	.....	18 00				
	2 20		4 40	—25						
	3 15		4 40	—25	.....	18 00				
	3 55		4 40	—25	.....	18 12				
	6 00		4 40	—25	.....	17 59,8				
	7 00		5 00	—25	.....	18 00,7				
	7 25		4 50	—25						

Needle nearly stationary, from 0^h 30^m P. M. until 0^h 30^m A. M. on the 19th.

Max. easterly variation took place at 5^h 3^m.

North end of Needle to the South.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 19th	7 40	A. M.	S 4 00 E	—25°	...	.....	
	7 50		3 40	—25	...	18 3,6		Overcast	
	8 00		3 40	—25	...	18 3,7			
	9 30		3 40	—24	...	17 56,5			
	10 00		3 20	—24 ₁	...	18 2,5			
	10 30		3 15	—24 ₂	...	18 2,5			
	11 30		3 10	—24 ₂	To the left hand.	17 56,5			
	Noon		2 55	—24 ₂	...	17 56,5			
	1 10	P. M.	2 50	—24 ₂	...	17 56,5			
	1 20		3 00	—24 ₂	...	17 56,5			
	1 30		1 00	—24 ₂	...	17 56,5			
	1 45		1 10	—24 ₂	...	17 56,5			
	2 00		1 20	—24 ₂	...	17 56,5			
	+ 2 30		1 30	—24 ₂	...	17 56,5			
	2 50		1 30	—24 ₂	...	17 56,5			
	3 30		1 30	—24 ₂	...	17 56,5			
	4 00		1 20	—26 ₁	...	17 56,5			
	5 00		1 20	—26	...	17 56,5			
	6 5		1 30	—26	...	17 56,5			
	7 3		1 10	—27	...	17 56,5			
	7 45		1 00	—27	...	17 56,5			
	9 10		1 20	—27	...	17 56,5			
	9 30		1 00	—27	...	17 56,5			
	10 00		0 30	—27	...	17 56,5			
	10 30		South	—27	...	17 56,5			
	11 00	A. M.	S 0 30 E	—27	...	17 56,5			
	11 40		0 40	—27 ₂	...	17 56,5			
	Mid ¹ .		1 00	—27	...	17 56,5			
	0 35		1 20	—27	...	17 56,5			
	1 00		1 30	—28	...	17 56,5			
	1 10		2 00	—28	...	17 56,5			
	1 30		2 20	—28	...	17 56,5			
	2 00		2 40	—27	...	17 56,5			
	2 10		2 50	—26 ₁	...	17 56,5			
	2 30		3 00	—26 ₁	...	17 56,5			
	2 40		3 00	—26 ₁	...	17 56,5			
	2 50		3 10	—26 ₁	...	17 56,5			
	3 00		3 30	—26 ₁	...	17 56,5			
	3 30		3 30	—26 ₁	...	17 56,5			
	4 00		3 30	—26 ₁	...	17 56,5			
	6 3		3 20	—28	...	17 56,5			
	7 3		3 20	—29	...	17 56,5			
	7 45		3 20	—29	...	17 56,5			
	9 00		3 20	—28	...	17 56,5			
	9 45		3 10	—28	...	17 56,5			
	9 55		3 00	—28	...	17 56,5			
	10 20		3 00	—28	...	17 56,5			
	11 36		3 00	—28	Very little motion to the left hand.	18 7,8			

North end of Needle to the South.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrnt.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.	
1825. Feb. 20th	h. m.	P. M.	° ,	—28	To the left hand.	m. s. 17 58,3	Northerly Light	Clear and fine	Max. westerly variation.	
	Noon		S 2 50 E	—28		17 53,7				
	0 7		2 00	—28		17 50,3				
	0 30		2 00	—28		17 50,5				
	1 00		1 30	—28		17 57,2				
	1 22		South	—27		17 54,3				
	2 00		S 0 20 W	—28		17 54,5				
	+ 2 5		0 30	—28		17 53,8				
	2 10		South	—28		17 55,6				
	2 30		S 0 10 W	—28		17 55,0				
	2 55		0 10	—28		17 57,5				
	3 20		0 10	—28		17 55,0				
	3 35		S 3 00 E	—28		17 57,2				
	3 52		3 40	—28		17 59,4				
	5 8		3 50	—28 1/2		17 59,4				
	6 00		3 50	—29		17 54				
	7 10		3 40	—29 1/2		17 54,7	Ditto	Ditto		
	7 40		3 30	—29 1/2		17 54,7				
Feb. 21st	9 3		3 40	—30		17 57,7				
	9 50		3 40	—29		18 0,5	Calm	Clear and fine	Max. easterly variation.	
	11 00		3 40	—30		18 9,2				
	11 50		3 40	—31		18 3,5				
	0 35	A. M.	3 30	—30		18 4,5				
	1 00		3 40	—30		17 57,5	Northerly Light	Clear and fine	Max. westerly variation.	
	1 30		3 40	—30		17 58,5				
	2 00		3 40	—30		18 4,5				
	2 30		3 40	—30		17 51,8				
	3 00		3 40	—30		17 50,7				
	3 30		3 49	—30		17 49,8				
	4 00		3 40	—30		17 49,8				
	4 20		3 40	—31		17 51,8				
	5 5		3 40	—31		17 50,9				
	5 30		3 50	—31		17 54,5				
	6 00		3 50	—31		17 54,7				
	6 28		3 50	—31		17 55,0				
	7 00		4 00	—31		17 55,0				
	7 35		3 50	—31		17 54,7				
	7 52		3 40	—31		17 54,7				
	9 30		3 30	—32		17 54,7				
	10 00		3 20	—32		17 54,7				
+ 10 20	2 50		—32	..		17 54,7				
	2 50		—32	..		17 54,7				
	2 50		—32	..		17 54,7				
	2 55		—32	..		17 54,7				
	Noon		2 50	—32		17 54,7				
	0 30		2 50	—32		17 54,7				
	1 00		2 50	—32		17 54,7				
	1 30		3 00	—32		17 54,7				
	1 40		3 10	—32		17 54,7				
	2 00		3 20	—32		17 54,7				
+ 3 6	3 30		3 30	—32		17 54,7				
	3 50		—30	..		17 54,7				
	3 6		3 50	—30		17 54,7				

North end of Needle to the South.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 21st	h. m.	P. M.	S 4 00 E	—30		m. s.			
	3 10		4 00	—30		17 50,8			
	3 20		3 50	—30	.....	17 50,5			
	3 40		3 40	—30	.....	17 43,5			
	4 55		3 40	—30	.....	17 48			
	6 00		3 40	—30	.....	17 50,5			
	7 00		3 40	—32	.....	17 50,0			
	7 45		7 30	—31	.....	17 54,5			
	9 20		7 50	—29	.....	17 57,8			♦ setting to the E N E by compass.
	10 00		7 00	—29	.....	17 56,5			
	10 30		7 00	—29	.....	17 58,3			
	11 00		7 00	—29	.....	18 00			
	11 30		6 50	—29	.....	18 5,5			
	Midn ^t		6 50	—29	.....	18 1,1			
	0 30	A. M.	6 50	—29	.....	18 9,0			
	1 00		6 50	—29	.....	18 4,8			
	1 30		6 40	—29	.....	18 14,8			
	2 00		6 20	—29	.....	17 54,9			
	2 15		6 20	—29	.....	17 50,3			
	2 36		6 40	—28 $\frac{1}{2}$	.....	17 51,5			
	3 00		6 20	—28 $\frac{1}{2}$	.....	17 50			
	3 32		6 20	—28 $\frac{1}{2}$	.....	17 54			
	4 6		6 20	—28 $\frac{1}{2}$	.....	17 56,4			
	5 40		6 10	—28 $\frac{1}{2}$	.....	18 5,5			
	7 00		5 20	—29	.....	18 1,1			
	7 50		5 20	—28 $\frac{1}{2}$	.....	18 9,0			
	9 10		5 00	—28 $\frac{1}{2}$	.....	18 4,8			
	9 56		4 50	—28 $\frac{1}{2}$	.....	18 14,8			
	10 20		4 30	—28 $\frac{1}{2}$	.....	17 54,9			
	10 50		3 50	—28 $\frac{1}{2}$	.....	17 50,3			
	11 20		S 1 00 W	—28 $\frac{1}{2}$	.....	17 55,2			
Feb. 22d	+ 11 50	P. M.	1 00	—27	.....	17 54,7			
	0 30		1 00	—27	.....	17 52,7			
	1 00		0 30	—27	.....	17 55,9			
	1 55		0 30	—27	.....	17 52,2			
	2 52		0 20	—27	.....	17 54			
	3 52		S 1 00 E	—28	.....	17 56			
	5 00		1 10	—27 $\frac{1}{2}$	.....	17 55,9			
	5 55		1 10	—28	.....	17 52,2			
	6 24		1 20	—27 $\frac{1}{2}$	.....	17 54			
	7 00		1 30	—28	.....	17 55,2			
	7 35		1 30	—28	.....	17 54,7			
	9 00		2 5	—28	.....	17 52,7			
	9 5		4 40	—28	.....	17 55,7			
	9 12		4 50	—28	.....	17 54			
	9 30		4 50	—28	.....	17 53,2			
	10 00		4 50	—28	.....	17 54			Aurora faint N. W.
	10 30		5 00	—28	.....	17 53,2			♦ east by compass.
	11 00		5 10	—28	.....	17 53,2			Aurora from N. to W.
	11 30		5 30	—28	.....	17 53,2			
	Midn ^t		5 30	—28	.....	17 53,2			

To the left hand.

Calms, succeeded by light airs from the northward.

Hazy near the horizon.

North end of Needle to the East.

The axes of the magnets placed north and south of the needle, were on this occasion inclined to the magnetic meridian at an angle of 22 degrees; the distance of the nearest ends of each, from the centre of the compass-box was 28 inches, and the time of performing one vibration by the needle was 16.4 seconds, so that the directive power now, was to the undiminished force as 0.113 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb 23rd.	h. m.								
	1 00	A. M.	E 0 0' N	—26	17 57.2	Eastward	Clear	Max. easterly var. Aurora bright to the north; at 4 ^h brilliant from NW to NE by (com- pass.)
	1 55		E 2 00 S	—27	.....	18 3.6	.....	.....
	3 00		10 00	—27	.....	18 5.2	.....	.....
	4 15		8 00	—27	.....	18 2.6	.....	.....
	5 30		7 30	—27	.....	18 3.4	.....	.....
	6 00		7 30	—27	.....	18 9.5	.....	.....
	6 40		7 30	—27	.....	.....	.....	.....
	7 00		4 40	—26 ¹	.....	.....	.....	.....
	7 5		10 00	—26 ¹	.....	18 13.7	.....	.....
	7 20		19 00	—26	.....	.....	.....	.....
	7 25		18 30	—26	.....	.....	.....	.....
	7 30		19 40	—26	.....	.....	.....	.....
	+ 7 32		20 00	—26	.....	.....	.....	.....
	7 35		20 10	—26	.....	.....	.....	.....
	7 40		19 00	—26	.....	.....	.....	.....
	7 42		18 50	—27	.....	.....	.....	.....
	8 8		10 00	—27	18 11.1	Easterly	Hazy	The max. westerly var. happened by the suspended needles at 10 ^h 48 ^m nearly. The indications of this needle appear to be rather those of changes of intensity than of direction, since the irregularities (by comparing them with the times of vib. of a hor. needle), were found to follow that law.
	8 12		9 30	—27	.....	.....	Fresh	.....
	9 10		4 40	—27	.....	18 1.5	.....	.....
	9 30		5 00	—27	.....	.....	.....	.....
	9 40		6 10	—27	.....	.....	.....	.....
	10 10		6 50	—26 ¹	.....	18 2.3	.....	.....
	10 30		3 00	—26	.....	.....	.....	.....
	10 40		4 30	—26	.....	.....	.....	.....
	11 00		4 00	—26	.....	17 59.3	.....	.....
	11 30		East	—26	.....	.....	.....	.....
P. M.	11 33		E 1 00 N	—26	Very cold W. Clear over- head, much drift, weather very cold.
	11 36		0 30	—26	.....	.....	.....	.....
	11 40		East	—26	.....	.....	.....	.....
	11 45		E 1 00 S	—25	.....	.....	.....	.....
	Noon		2 00	—25	.....	17 59.6	East	Hazy
	0 10		1 30	—25	.....	.....	.....	.....
	0 50		East	—25 ¹	.....	.....	Fresh	.....
	1 00		E 3 00 N	—25 ¹	.....	17 54.5	.....	.....
	1 15		4 20	—25 ¹	.....	.....	.....	.....
	1 25		5 10	—25 ¹	.....	.....	.....	.....
	1 30		5 10	—25 ¹	.....	.....	.....	.....
	1 35		5 00	—25 ¹	.....	.....	.....	.....
	1 45		5 20	—25 ¹	.....	.....	.....	.....
	2 00		5 30	—25 ¹	.....	17 51.3	.....	.....
	2 10		5 20	—25 ¹	.....	.....	.....	.....
	2 30		4 00	—25 ¹	.....	.....	.....	.....
	3 00		4 00	—25 ¹	.....	17 54	.....	.....
	3 25		4 00	—25 ¹	.....	.....	.....	.....
	3 55		4 00	—25 ¹	.....	17 51.4	.....	.....
	5 30		5 00	—25 ¹	.....	17 50.1	.....	.....

North end of Needle to the East.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 23rd	h. m.								
	6 00	P. M.	E 5 00 N	—25 $\frac{1}{2}$	.....	m. s.			
	6 40		5 00	—25 $\frac{1}{2}$	.....	17 53,7			
	7 40		5 00	—26	.....	17 51,8			
—	8 30		6 20	—26	.....	17 46,3	.....	.....	Aurora faint to the northward.
	8 40		6 00	—26	.....			
	9 00		5 10	—26	.....	17 50,7			
	9 10		4 10	—25	.....			
	9 20		3 30	—25	.....			
	9 30		3 30	—25	.....			
	9 40		3 00	—25	.....			
	9 45		3 20	—25	.....			
	10 00		3 10	—25	.....	17 52,2			
	10 30		3 00	—25	.....			
	10 45		2 30	—25	.....			
	11 00		2 00	—25	.....	17 55			
	11 15		1 40	—25	.....			
	11 30		1 30	—25	.....			
	11 38		1 00	—25	.....			
	Midn ^t		1 00	—25	.....			
Feb. 24th	o 5	A. M.	o 40	—25	.....	17 55,3			
	1 26		East	—25	.....			
	1 56		E o 10 S	—25	.....	17 56,5	Eastward		
	2 15		o 50	—25	.....	17 58	Fresh		
	2 40		1 00	—25	.....			
	3 10		o 55	—25 $\frac{1}{2}$	.....	17 56,3			
	5 40		2 30	—26	.....	18 0,6			
	6 40		5 00	—26	.....			
+	7 40		5 30	—27	.....	18 1,5	Squally		
	8 56		5 10	—27	.....	18 2,7			
	9 40		4 45	—27	.....	17 55,8			
	9 55		3 00	—27	.....	17 52,8			
	10 30		2 30	—26 $\frac{1}{2}$	.....			
	10 50		1 30	—26 $\frac{1}{2}$	.....	17 49,4			
	11 00		1 00	—26 $\frac{1}{2}$	.....			
	11 30		o 40	—26 $\frac{1}{2}$	.....			
	Noon		o 50	—26 $\frac{1}{2}$	.....	18 2,4			
	o 30	P. M.	o 30	—26 $\frac{1}{2}$	.....			
	o 45		o 30	—26	.....			
	1 15		E o 30 N	—26	.....	17 52,3			
	1 30		1 30	—6	.....			
—	3 30		2 20	—27	.....	17 51,5			
	4 45		2 00	—26	.....	17 53			
	5 50		2 00	—25	.....	17 55,2			
	6 50		2 00	—25	.....	17 55,4			
	7 15		2 00	—25	.....			
	9 12		1 50	—25	.....	17 55,6	East		
	9 40		1 30	—25 $\frac{1}{2}$	.....	17 54,1	Fresh	Cloudy	
	10 25		1 30	—26	.....			

North end of Needle to the East.

North end of Needle to the West.

What has been said of the adjustment of the magnets at the commencement of the observations at East, obtain here also; except that the axis of each magnet in this instance, was oppositely inclined to the meridian at an angle of 22 degrees, in order to direct the north end of the needle into its present position.

Date.	Mean Time of Observation.	A. M. or P.M.	Reading of north end of needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 26th	h. m.	A. M.	West	—27	m. s.	East. strong	Hazy	<i>Max. easterly var.</i>
	1 00		W 2 40 N	—27		17 55,8			
	2 00		3 30	—27		17 55,4			
	2 35		3 30	—26		17 56,0			
	3 00		3 30	—26		18 00,2			
	3 30		3 30	—26		17 58,1			
	3 55		3 40	—25		18 00,5			
	5 30		4 30	—25		18 2,2			
	6 4		4 50	—25		17 57,3			
	7 5		4 40	—25		17 57,0			
	9 30		4 40	—25		17 55,5			
	10 00		4 40	—22		17 55,7			
	11 00		4 30	—21		E S E	Strong gales, with drift.	<i>Max. westerly var.</i>	D WNW by compass.
	Noon		2 30	—21		17 56,5			
	1 00		1 40	—21		17 56,8			
	1 30		1 00	—21		17 57,6			
	1 45		West	—21		17 56,5			
	1 50		W 1 40 N	—21		17 57,4			
	2 15		1 00	—21		17 56,9			
	2 20		West	—21		18 00,5			
	2 30		W 0 10 S	—21		E S E			
	3 9		West	—19		17 56,6			
+ Feb. 27th	3 50		West	—19		17 56,4			
	5 30		W 0 15 S	—18		17 56,8			
	6 20		W 0 10 N	—17		17 56,6			
	6 55		0 10	—17		17 56,9			
	7 40		0 20	—16		18 00			
	9 30		0 30	—14 $\frac{1}{2}$		E S E	Thick & hazy	<i>Max. easterly var.</i>	D WNW by compass.
	10 00		0 30	—14 $\frac{1}{2}$		18 00,5			
	10 30		0 30	—14 $\frac{1}{2}$		18 1,3			
	11 00		0 30	—14 $\frac{1}{2}$		18 1,5			
	11 30		0 30	—14 $\frac{1}{2}$		18 1,5			
	Midn ^t		0 40	—14 $\frac{1}{2}$		18 1,5			
	0 15	A. M.	1 00	—14 $\frac{1}{2}$		Easterly light	Thick & hazy with snow	<i>Max. easterly var.</i>	Cloudy
	1 8		1 20	—14		18 1,5			
	2 5		1 30	—14		18 3,7			
	3 00		1 40	—14		18 3,8			
	3 50		1 40	—14		18 4,2			
	5 30		1 50	—14		18 3,5			
	6 10		1 50	—14		18 2,2			
	6 30		1 50	—14 $\frac{1}{2}$		18 3,2			
	7 00		1 50	—14		18 5,0			
	7 55		1 55	—14		18 4,9			
	9 00		1 55	—14					

Lieut. FOSTER's observations on the diurnal changes

North end of Needle to the West.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
									Instrument
1825. Feb. 27th	h. m.	A. M.	0 ,	0					
	9 30		W 2 00 N	—14					
	10 00		2 00	—13	.....	18 7,5			
	10 34		3 00	—14					
	11 00		3 40	—12	.....	18 8,2			
	— 11 20		4 00	—13					
	11 46		3 40	—13					
	Noon.		2 30	—13	.....	18 4,0			
	0 20	P. M.	2 20	—12					
	0 30		2 20	—12					
	1 00		2 20	—12	.....	18 4,5			
	2 00		2 00	—12	.....	18 0,2			
	2 10		1 30	—12	.....		East		
	2 50		1 00	—12	.....	18 0,7	Moderate	Clear	
	4 30		0 50	—12	.....	18 0,5			
	5 00		0 50	—12	.....	17 59	Ditto	Cloudy	
	5 34		0 50	—12	.....			
	6 5		0 50	—13	.....	18 0,4	Ditto	Very	
	7 10		0 40	—13	.....	18 2,6		Hazy	
	7 55		0 40	—13	.....	18 2,2			
	9 30		0 30	—13	.....	18 2			
	+ 10 5		0 20	—14	.....	18 2,4			Max. easterly
	10 58		0 20	—14	.....	18 1,1			var.
	11 30		0 20	—13	.....			
	Mid ^t .		0 20	—13	.....	18 1,5			
	0 15	A. M.	0 30	—13	.....	18 1,0	North	Cloudy	
	1 20		0 40	—13	.....		Moderate		
	1 40		0 40	—13	.....			
	2 6		0 50	—13	.....	18 2,3			
	2 30		0 50	—13	.....			
	3 00		0 50	—13	.....	18 1,1			
	3 40		0 55	—13	.....	18 1,4	N. W.		
	5 6		1 10	—13	.....	18 4,1	Moderate	Hazy	
	6 5		1 30	—13	.....	18 5,0			
	7 3		1 40	—13	.....	18 5,0			
	7 50		2 00	—14	.....	18 6,5			
	9 00		3 25	—14	.....	18 5,4			
	9 30		3 30	—14	.....		North		
	— 9 40		3 40	—14	.....		Light	Clear and	
	10 15		3 40	—14	.....	18 2,8		Fine	
	10 45		3 30	—14	.....			
	11 00		3 00	—14	.....	18 1,5			
	11 25		3 00	—14	.....			
	11 40		2 30	—14	.....			
	Noon		2 30	—14	.....	18 0,5			Max. westerly
	1 00	P. M.	1 30	—14	.....	17 56,6			var.
	1 30		West	—14	.....	17 59,3			
	2 00		West	—14	.....			
	2 20		West	—14	.....			
	+ 2 45		W 0 30 S	—15	.....	17 58,8			

North end of Needle to the West.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 28th	h. m.	P. M.	o 6	o 17	.....	m. s. 17 57,5	Easterly Light	Clear and Fine	
	6 3		o 5	18	.....	17 57,3			
	6 55		W o 20 N	19	.....	17 59,6			
	7 00		o 30	19	.....			
	7 55		o 40	19	.....	17 59,0			
	9 30		o 40	20	.....	17 57,2			
	10 00		I 00	20	.....	17 57,7			
	10 30		I 00	20	.....			
	11 6		I 00	20	.....	17 57,6			
	11 40		I 00	20	.....			
	Mid ^t .		I 00	20	.....			
	1 00	A. M.	I 00	19 $\frac{1}{2}$	.....	17 58,1			
	1 30		I 00	19	.....	17 59,5			
	2 00		I 10	18 $\frac{1}{2}$	.....	18 00			
	3 00		2 30	18 $\frac{1}{2}$	.....	17 59,3			
	5 10		4 00	19	.....	18 1,4	S. W. Moderate	Hazy westward	
	6 8		4 30	19	.....	18 3,3			
	7 6		5 00	20	.....	18 4,8			
	7 40		7 50	20	.....	18 8,2			
	9 00		7 30	21 $\frac{1}{2}$	.....	18 11			
	9 30		7 30	22	.....			
	10 15		7 30	22	.....	18 7,8	NE by E Fresh	Thick with drift	
	10 45		7 30	23	.....			
	11 15		7 30	23	.....	18 9,5			
	11 45		5 30	24	.....			
	Noon.		4 00	24	.....	17 50,5			
	o 8	P. M.	West	24	.....			
	+ 0 30		W o 30 S	24 $\frac{1}{2}$	.....			
	1 00		o 30	24 $\frac{1}{2}$	.....	17 52	NE Fresh	Overcast	
	1 30		West	24 $\frac{1}{2}$	.....			
	2 00		West	24 $\frac{1}{2}$	.....	17 53,2			
	2 30		West	24 $\frac{1}{2}$	.....			
	3 00		W 1 00 N	25 $\frac{1}{2}$	.....	17 52,8			
	3 30		I 5	25 $\frac{1}{2}$	.....			
	4 4		I 15	26	.....	17 54,3	North Light	Hazy	Max. easterly variation.
	5 10		I 30	26	.....	17 55,2			
	6 00		2 00	26	.....	17 56			
	7 00		2 10	26	.....	17 56,6			
	7 50		2 10	26	.....	17 57,8			
	10 30		2 00	30	.....	17 55,0	N. Easte ^r Light	Clear and Fine	D Mag. North.
	11 00		2 00	30	.....	17 54,0			
	11 30		2 20	30	.....			
	Midn ^t		2 00	30	.....	17 55,5			

It will be seen, that when the north end of the needle pointed towards the east or west, the direction of its motion during the time of westerly daily variation, is not specified according to the mode described; I have not ventured to do so, in consequence of the many irregularities in its direction, produced by the variations of horizontal intensity, which were always indicated by this needle, and which rendered its direction as to the *right and left hand* during the time of westerly daily variation, very doubtful.

North end of Needle to the S. W.

The distance of the nearest ends of the magnets from the centre of the compass 27 inches; the axis of each magnet was inclined to the magnetic meridian, and the needle under their influence made one vibration in $12\frac{1}{2}$ seconds; so that the directive force now, was to the undiminished force as 0,20 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.			
1825. Mar. 2d	h. m.	A. M.	0	0	m. s. 17 56,3	Northerly Light	Clear and Fine				
	1 00		42 00W	—29	.....	17 58					
	1 30		41 50	—30	17 59,1	Calm					
	2 00		41 30	—29 $\frac{1}{2}$	.....	18 9,3					
	2 30		40 50	—30	18 3	Easterly Light	Clear and Fine				
	3 20		40 20	—30	.....	18 3					
	4 00		39 50	—30 $\frac{1}{2}$	.....	18 1,8					
	5 6		40 00	—31	.....	18 00,5					
	6 8		40 20	—31	Max. westerly variation.					
	7 6		41 20	—31	.....	.....				
	7 54		41 30	—32	.....	.....				
	9 00		43 20	—32	.....	.....				
	9 30		44 00	—32	.....	.....				
	10 00		45 30	—32	.....	17 53,2					
	10 30		46 10	—31	.....	17 53,6					
	11 00		46 20	—30	.....	17 46,5					
	11 30		45 50	—30	.....	17 49					
	12 15	P. M.	45 30	—30	.....	17 53,6					
	12 35		45 30	—30	.....	17 52,8					
	1 00		45 30	—30	.....	17 54,4					
	1 30		49 30	—30	At 1 ^h 25' P.M. the needle com- menced moving rapidly to the westward, inten- sity at that time increasing.					
	+ 1 40		50 15	—30	.....	17 48,5					
	2 00		50 10	—29 $\frac{1}{2}$	.....	17 48,5					
	2 30		50 00	—29 $\frac{1}{2}$	.....	17 46,5					
	3 5		48 20	—29	.....	17 49					
	3 55		47 40	—29	.....	17 53,6					
	5 00		44 30	—29 $\frac{1}{2}$	.....	17 52,8					
	5 40		44 20	—29 $\frac{1}{2}$	.....	17 54,4					
	6 15		44 00	—29 $\frac{1}{2}$	.....	.....				
	7 00		43 55	—30	.....	.....				
	7 40		44 00	—30	.....	17 52,7					
	8 00		44 00	—30	17 53,5	Easterly Light	Clear and Fine				
	9 00		44 00	—30 $\frac{1}{2}$	.....	17 54,2					
	11 00		43 40	—31	.....	17 54					
	Mid ^t .		43 00	—31	17 57,0	Easterly Light	Clear and Fine				
	1 10	A. M.	42 30	—31	.....	17 59,6					
	2 6		40 20	—31	.....	18 1,3					
	3 0		39 50	—31	.....	18 8,5					
	3 50		38 30	—31	17 57,4	Squally	Hazy				
	5 10		40 40	—31	.....	.....				
	5 40		41 20	—31	.....	.....				

North end of Needle to the SW.

Date.	Mean Time of Obser- vation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren ^t . Instr.	Direction of north end of needle during westerly daily variation.	Time that a ho- rizontal needle took to make 60 vibrations.	Winds,		Remarks, &c.
							Winds,	Weather.	
1825. Mar. 3rd	h. m.	A. M. S	0	0	m. s.	D South mag ^t .	Easterly moderate	Overcast
	6 15		41 30 W	-31	.....	17 55,5		
	6 50		42 00	-31 $\frac{1}{2}$	.....	17 56,3		
	7 25		42 50	-31 $\frac{1}{2}$	.....	17 57,1		
	8 4		42 50	-31 $\frac{1}{2}$	.....	18 13,3		
	9 50		40 00*	-31	.....	18 14,5		
	9 55		38 30	-29	.....	18 14,5		
	10 20		37 30	-29	.....	18 14,5		
	10 30		37 30	-29	.....	18 14,5		
	10 55		+ 37 00	-29	.....	18 14,5		
	11 00		38 50	-28 $\frac{1}{2}$	.....	18 14,5		
	11 20		45 30	-28 $\frac{1}{2}$	.....	18 14,5		
	11 35		47 10	-28 $\frac{1}{2}$	.....	18 14,5		
	11 40		47 40	-28	.....	18 14,5		
	11 42		48 00	-28	.....	18 14,5		
	11 50		49 30	-28	.....	18 14,5		
	11 55		49 50	-28	.....	18 14,5		
	Noon.		50 00	-28	.. To the left hand.	17 43,2	E S E Fresh	Hazy with drift	Max. westerly var. at 11 ^h 22 ^m A.M.
	0 15	P. M.	50 00	-28	..	17 46,3			
	1 10		49 40	-28	..	17 46,3			
	1 40		49 30	-28	..	17 46,3			
	2 20		49 00	-28	..	17 46,3			
	2 50		48 40	-28	..	17 46,3			
	3 10		48 40	-28	.....	17 46,3		
	3 45		48 40	-28	.....	17 46,3		
	+ 5 6		53 20	-27	.....	17 40,8		
	6 5		51 10	-27	17 48,5	East, strong; thick near the horizon, clear over head.	Max. easterly var. 11 ^h 30 ^m D true South
	7 4		51 00	-27	.....	17 46,8		
	7 50		45 30	-27	.....	17 49,6		
	9 30		45 30	-27	.....	17 53		
	10 15		45 25	-26 $\frac{1}{2}$	.....	17 55,5		
	11 10		44 20	-26	.....	17 56,3		
	11 12		43 50	-26	.....	17 56,3		
	11 45		42 30	-26 $\frac{1}{2}$	.....	17 57,5		
	Midn ^t		42 30	-26 $\frac{1}{2}$	.....	17 57,5		
	0 10	A. M.	42 30	-26 $\frac{1}{2}$	.....	17 57,5		
	0 35		42 30	-26 $\frac{1}{2}$	.....	17 55,6		
	1 20		42 30	-26 $\frac{1}{2}$	.....	17 56,7		
	1 55		42 30	-26	.....	17 56,7		
	2 20		42 30	-26	.....	17 57,4		
	2 50		42 40	-26	.....	17 57,4		
	3 10		42 40	-26 $\frac{1}{2}$	17 57	Easterly Light	Clear and Fine
	3 55		43 00	-26 $\frac{1}{2}$	.....	17 57,8		
	5 12		43 40	-27	.....	17 57,8		
	- 6 6		40 30	-27	.....	18 3,0		
	7 8		41 40	-27	.....	18 1,2		
	7 50		42 50	-27	.....	18 2,6		
	9 00		40 30	-27	.....	18 2,3		
	9 40		41 40	-26 $\frac{1}{2}$	.....	17 56		
	10 10		44 00	-26 $\frac{1}{2}$	.....	.....	
	10 25		45 00	-26	.....	.....	

Lieut. FOSTER's observations on the diurnal changes

North end of Needle to the S. W.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.						
							Instr.	Winds.	Weather.	Remarks, &c.		
1825. Mar. 4th	h. m.	A. M.	S 45 00W	—26	To the left hand.	m. s.				Max. westerly variation.		
	10 40		45 20	—26		17 59,7						
	11 5		46 20	—26		17 56,3	Calm	Ditto				
	11 10		46 20	—26		17 51,8						
	11 50		46 20	—26		17 50,5						
	0 30	P. M.	47 10	—26		17 50	Easterly Light	Fine clear weather				
	1 00		47 20	—25		17 56,2						
	2 00		47 40	—25		17 54,3						
	2 5		50 00	—25		17 55,9						
	+ 2 10		50 25	—25		17 53,3						
	2 35		50 25	—25		17 49						
	2 38		49 30	—25		17 45,6	Easterly Light	Very clear and fine				
	3 00		49 5	—25		17 50,7						
	3 32		47 40	—25		17 55,8	Calm	Clear and fine				
	4 00		47 00	—25		17 55,8						
	4 5		46 30	—25		17 51,2	Ditto	Max. easterly variation.				
	4 7		46 00	—25		17 52,3						
	5 10		45 10	—25		17 48,5	Hazy					
	6 3		45 5	—26		17 50,5						
	7 6		45 0	—26		17 51,8						
	7 50		45 0	—27		17 52,3						
	9 00		44 50	—26 ¹		17 49						
	9 30		44 40	—27		17 45,6						
	10 10		44 50	—27		17 50,7						
	10 50		44 50	—27 ¹		17 55,8						
	11 30		44 50	—27 ¹		17 55,8						
	11 56		44 50	—27 ¹		17 55,8						

North end of Needle to the N. W.

In this case, the ends of the magnets nearest the needle were 29,4 inches from the centre of the compass-box, and the time of performing one vibration by the needle thus circumstanced was 14,4 seconds, so that the directive force now, was to the undiminished force as 0,15 to 1.

Mar. 5th	2 10	A. M.	N 48 00W	—26	To the right hand.	17 58	Easterly Light	Hazy		
	2 30		48 00	—26		17 59,3				
	3 00		48 10	—26		18 7	Westerly moderate	Thick & Hazy		
	3 10		49 10	—26		18 0,5				
	3 15		50 00	—26		17 59,8				
	3 20		50 30	—26		18 5,0				
	4 00		51 30	—26		18 1,8				
	5 10		52 00	—26		17 55,5				
	6 6		51 30	—26		17 51,2				
	7 6		51 30	—26		17 52,3				
	+ 7 50		52 00	—26		17 48,5				
	9 30		50 10	—25 ¹		17 55,8				
	10 30		49 00	—26		17 51,2				
	11 00		48 40	—26		17 52,3				
	11 30		49 00	—26		17 55,8				
	11 35		48 30	—26		17 55,8				
	Noon		47 00	—25 ¹		17 55,8				

North end of Needle to the N. W.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 5th	h. m.	P. M.	0 46 ' 00 W	0	.....	m. s.			
	1 00		45 40	—25 $\frac{1}{2}$	.....	17 53,4			
	1 30		45 40	—24 $\frac{1}{2}$	.....			
	2 00		45 40	—24 $\frac{1}{2}$	.....	17 57,2			
	2 30		46 10	—24 $\frac{1}{2}$	.....			
	3 00		46 10	—25	.....	17 54,5			
	3 20		44 00	—25	.....			
	— 3 50		43 50	—25	.....	17 53,8			
	4 55		44 00	—26	.....	17 58			
	6 5		44 00	—27	.....	17 55,2			
	6 45		44 00	—27	.....	17 54			
	7 40		44 20	—27	.....	17 55,9			
	9 10		45 20	—26 $\frac{1}{2}$	.....	17 52,8			
	9 32		45 20	—27	.....			
	9 58		45 30	—27	.....	17 53,7			
	10 30		45 45	—27	.....			
	11 4		45 35	—27	.....	17 54,8			
	11 27	Midn ^t	45 30	—27	.....			
	Midn ^t		46 00	—27	.....	17 55,9			
Mar. 6th	1 10	A. M.	46 10	—27	.....	17 57,3			
	1 50		46 10	—27	.....	17 56,8			
	2 30		46 30	—27	.....			
	3 00		48 50	—27	.....	18 6			
	3 25		49 30	—26 $\frac{1}{2}$	.....			
	3 40		51 00	—26 $\frac{1}{2}$	.....			
	3 50		52 30	—26 $\frac{1}{2}$	.....			
	3 55		53 20	—26 $\frac{1}{2}$	.....			
	5 5		54 00*	—25	.....			
	+ 6 10		60 00	—24	.....			
	7 5		52 30	—23	.....			
	7 53		54 00	—23	.....			
	9 00		57 20	—23	.....			
	9 5		57 00	—23	.....			
	9 40		58 10+	—23	.....			
	9 45		57 30	—23	.....			
	10 00		50 00	—23	.....	18 1			
	10 30		49 10	—23	.....			
	10 50		51 30	—23	.....			
	11 00		53 20	—23	.....	18 1,5			
	11 5		54 30	—23	.....			
	11 10		55 30	—23	.....			
	11 15		55 40	—23	.....			
	11 29		54 30	—23	.....			
	11 31		50 30	—23	.....			
	Noon.		49 10	—23	.....	17 49,5			
	0 5	P. M.	47 00	—23	.....			
	0 30		46 55	—23	.....			
	1 2		46 45	—23	.....	17 50			
	1 27		46 00	—23	.....			
	1 55		45 55	—23	.....	17 54,7			
	— 2 53		45 00	—24	.....	17 54,9			

Immediately after 11^h 29^m A. M. the needle went rapidly towards the north, at which time, also, it was observed that a considerable increase in the horizontal intensity took place.

Lieut. FOSTER's observations on the diurnal changes

North end of Needle to the N. W.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.				
1825. Mar. 6th	h. m.	P. M.	N 45° 00' W	°	.....	m. s.	.....	.....	.....	
	3 20												
	3 45						17 54.5	S W mod.	Hazy				
	5 15												
	5 50						17 52.5	West Mod.	Hazy				
	6 15												
	6 50						17 51.8	.....	.....		
	7 15												
	7 50						17 52.3	.....	.....		
	8 54												
	9 15						17 52.7	.....	.....		
	9 45												
	10 5						17 56.5	Ditto	Ditto				
	10 58												
	11 50	A. M.					17 54.5	Stars scarcely visible through the haze.	Max. easterly variation.				
	1 10												
	2 3						17 56.3	Westerly	Very hazy				
	3 0												
	3 53						17 55.6	Mod.	.....			
	5 10												
	5 40						17 56.5	.....	.....		
	6 10												
	6 50						17 56.6	.....	.....		
	7 15												
	7 50						18 0.4	.....	.....		
	9 5												
	+ 10 0						17 55.2	.....	.....		
	10 35												
	10 40						17 59.7	.....	.....		
	11 10												
	11 30						17 57.5	.....	.....		
	0 5												
	0 7						17 59.1	North Light	Hazy				
	0 9												
	0 20						17 59.8	.....	.....		
	1 10												
	1 40						17 57	.....	.....		
	1 55												
	2 20						17 55.8	Calm	Clear and fine weather, a few thin clouds near the horiz.				
	2 50												
	3 10						17 55.8	.....	.....		
	3 58												
	5 5	P. M.					17 55.8	N W light	.....			
	6 5												
	7 3						17 53.2	.....	.....		
	- 7 52												
	9 5						17 53.3	.....	.....		
	9 42												
	10 00						17 50.5	.....	.....		
	11 00												
	11 30						17 53.4	Easterly	Very fine and clear				
	Midn ^t												
	48 20						17 53.2	.....	.....		
	48 50												
	49 40						17 54.6	Light	.....			
	49 40												
	49 40						17 55.6	.....	.....		
	49 40												
	49 40						17 54.5	.....	.....		
	49 40												
	49 40						17 55.5						.....	.....
	49 40												
	49 40						17 56						.....	Very thick weather
	48 20												

Max. easterly var.
happnd at 2^h 50^m
A. M. on the 8th.

North end of Needle to the W. S. W.

In this position, both magnets were placed to the south of the compass; the north pole of one magnet, and the south pole of the other, were directed towards the needle, so as to attract each extremity; the distance from the centre of the box, to the end of the magnet attracting the north end of the needle, was 18,65 inches, and to that attracting the south end of the needle, 28,4 inches; the needle then made 1 vibration in 8,6 seconds, so that, the directive force was reduced in the ratio of 0,42 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 14th	h. m.								
	1 5	A. M.	S 68° 30' W	—26°	.....	m. s. 17 58,5	Calm	Fine and clear, star light	<i>Max. easterly variation.</i>
	2 0		68 30	—27	.....	17 58,5			
	2 20		68 30	—27					
	2 50		68 30	—27					
	3 10		68 30	—27	.....	18 1,2			
	3 55		68 30	—27	.....	18 3,9			
	5 10		70 50	—27	.....	18 00			
	5 50		70 10	—27					
	6 5		69 20	—27					
	7 00		69 35	—27 ¹ ₂	.. To the left hand. ..	18 4,2			
	7 30		69 20	—27 ¹ ₂		18 2,3			
	8 00		68 20	—27 ¹ ₂		18 7,8			
	9 00		68 20	—27 ¹ ₂		18 19			
	9 40		68 40	—27 ¹ ₂					
	10 30		69 00	—27 ¹ ₂					
	10 45		68 20	—25					
	11 00		68 30	—25	.....	18 9,3			
	11 40		69 00	—25	.....	.....	
	Noon		71 15	—25	.....			
	0 30	P. M.	71 50	—23	.....	17 59,5	Easterly	Clear and fine	<i>Max. westerly variation.</i>
	0 35		72 00	—23	.....	.....	Light	Clear and fine	
	0 40		71 55	—23					
	0 45		72 00	—23					
	0 50		72 30	—23					
	1 00		72 30	—23	.....			
	1 10		73 00	—23					
	1 20		73 30	—23					
	1 30		74 30	—22 ¹ ₂					
	1 35		75 00	—22 ¹ ₂					
	1 45		75 30	—22 ¹ ₂					
	2 00		75 30	—22					
	2 5		75 40	—22					
	2 7		76 00	—22					
	2 15		76 15	—22					
	2 20		76 30	—22					
	2 30		76 50	—22 ¹ ₂					
	+ 2 40		77 00	—22 ¹ ₂	.....			
	3 5		77 00	—22 ¹ ₂	.....	17 52,7			
	3 27		76 55	—22 ¹ ₂					

North end of Needle to the W. S. W.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 14th	h. m.	P. M.	76 20' W	—22 $\frac{1}{2}$	.....	m. s. 17 54.7			
	4 26		76 15	—22 $\frac{1}{2}$	.....			
	4 30		75 00	—23	.....	17 52.1			
	5 00		74 10	—23	.....			
	5 30		74 00	—23 $\frac{1}{2}$	.....			
	5 45		73 30	—23 $\frac{1}{2}$	.....	17 54.5			
	6 00		73 00	—23 $\frac{1}{2}$	.....			
	6 10		72 50	—24 $\frac{1}{2}$	.....			
	6 30		72 40	—25 $\frac{1}{2}$	.....			
	7 12		72 40	—25	.....	17 53.1			
	7 50		72 40	—25	.....	17 55.8			
	9 25		72 50	—27	.....	17 58			
	10 20		72 50	—27	.....	17 53.5			
	11 50		72 50	—27	.....	17 56.3			
	1 00	A. M.	72 40	—27	.....	17 56.7			
	1 32		72 30	—27	.....			
	1 56		72 15	—27	.....	17 57.7			
	2 50		72 00	—27	.....	17 59.3			
	3 30		71 40	—27	.....			
	3 55		71 30	—27	.....	18 3.2			
	4 25		71 30	—27	.....			
	5 6		70 50	—28	.....	18 0.7			Max. easterly var.
	5 30		70 50	—28	.....			
	6 00		70 50	—27 $\frac{1}{2}$	.....	17 58.2			
	6 50		70 50	—27 $\frac{1}{2}$	.....			
	7 15		70 50	—27 $\frac{1}{2}$	.....	17 55.8			
	7 30		71 00	—27 $\frac{1}{2}$	.....	17 59.8			
	9 10		71 00	—27	.....	17 58.6	N. wester		
	9 42		71 00	—26	.....		Light		
	10 15		71 35	—25	..	17 57			
	10 40		71 50	—24 $\frac{1}{2}$..				
	11 14		72 20	—24	..	17 57.8			
	Noon		73 10	—23	..	17 59.5			
Mar. 15th	0 35	P. M.	73 00	—23	..	17 57.1			
	1 00		73 00	—23	..				
	1 30		72 40	—23	To the left hand.	..			
	1 40		73 00	—23					
	2 00		73 00	—22 $\frac{1}{2}$	.....	17 55.2			
	2 30		73 10	—22 $\frac{1}{2}$	.....			
	2 45		73 00	—22	.....			
	3 30		73 10	—22	.....	17 52.2	N. wester		
	3 50		74 45	—22	.....		Light		Parhelion one each side of ☽.
	4 30		75 10	—22 $\frac{1}{2}$	.....	17 50.1			
	+ 5 00		76 00	—22 $\frac{1}{2}$	.....	17 45.3			Max. westerly variation.
	5 15		76 00	—22 $\frac{1}{2}$	.....			
	5 30		76 00	—23	.....	17 47.1			
	6 30		76 00	—23 $\frac{1}{2}$	.....			
	7 15		76 00	—23 $\frac{1}{2}$	.....	17 50.1			
	8 10		76 00	—23 $\frac{1}{2}$	.....	17 50.3	N. W.		
	9 00		75 55	—23 $\frac{1}{2}$	.....	17 53	Mod.		
	9 30		75 40	—23 $\frac{1}{2}$	.....		Hazy		Max. easterly variation.

North end of Needle to the W. S. W.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vib ^o .	Winds.	Weather.	Remarks, &c.
1825. Mar. 15 th	h. m.	P. M.	75 50' W	—24	.....	m. s.			
	10 10		75 50	—24	.....	17 55			
	11 00		75 40	—24	.....	17 56,7			
	11 46		75 40	—24	.....	17 56,5			
	12 20		74 5	—24	.....	17 57,5			
	1 50		74 00	—24	.....	17 57,7			
	2 30		73 10	—24 $\frac{1}{2}$	.....			
	3 00		73 50	—24 $\frac{1}{2}$	.....	18 00,3			
	3 45		73 40	—24 $\frac{1}{2}$	.....	17 58			
	5 5		72 30	—24 $\frac{1}{2}$	.....	18 0,2			
Mar. 16 th	5 50		72 10	—25	.....	17 58			
	6 20		72 10	—25					
	7 10		72 00	—24 $\frac{1}{2}$	.....	18 0,2			
	7 25		71 55	—24 $\frac{1}{2}$	.....	18 0,6			
	9 00		71 40	—24 $\frac{1}{2}$	.....	18 1,5			
	9 30		71 30	—24 $\frac{1}{2}$	.....			
	10 00		71 30	—24	.....	18 1,5			
	10 30		71 20	—24	.....			
	11 00		71 30	—24	.....	18 1,8			
	11 20		71 40	—24	.....			
	11 30		71 30	—24	.....			
	Noon		71 30	—23	.....	17 56,6			
	0 5	P. M.	72 00	—23					
	0 15		73 00	—23					
	0 30		73 00	—23					
	0 45		72 30	—23					
	1 00		72 30	—23	.....			
	1 15		72 40	—23					
	1 30		73 20	—23					
	1 45		73 30	—23					
	2 00		73 30	—23					
	2 10		73 20	—23					
	2 30		73 30	—23					
	2 56		73 30	—23					
	3 15		73 30	—23					
	3 40		74 20	—23					
	4 15		75 10	—23 $\frac{1}{2}$	.....			
	4 45		75 15	—23 $\frac{1}{2}$	.....			
	+ 5 20		75 30	—23 $\frac{1}{2}$	.....			
	6 45		75 30	—24					
	7 15		75 30	—24	.....	17 46,9			
	7 55		74 40	—24	.....	17 48,8			
	9 5		73 30	—24 $\frac{1}{2}$	.....	17 54,5			
	9 50		73 25	—24 $\frac{1}{2}$	.....			
	10 20		73 00	—24 $\frac{1}{2}$	.....	17 55,7			
	11 00		72 30	—24 $\frac{1}{2}$	.....	17 55,8			
	11 30		72 00	—24 $\frac{1}{2}$	.....			
	Mid ^t		72 00	—24 $\frac{1}{2}$	.....	17 56,7	Fresh NNW	Hazy	

It will be seen
that the *max. deflections* of this
needle, took place
about the same
time that a de-
crease & increase
of intensity in
the directive
force of the hori-
zontal needle
took place.
Max. westerly var.

North end of Needle to the S 85° W. The line of minimum daily variation.

The distance of the nearest end of each magnet placed to the South, from the centre of the compass-box, was, of that attracting the North end of the needle 18.6 inches, and of the other attracting the South end of the needle 27.5 inches: under this adjustment, the needle made one vibration in 10.2 seconds, so that the directive power now, was to the undiminished force as 0.31 to 1. nearly.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 23d	h. m.	A. M.	S 83° 30' W	—26°	m. s. 18 2			Max.easterly var. took place at 2 ^h 5 ^m A. M.
	6 30		83 30	—26	.....	18 2,2		
	7 10		83 30	—26	.....			
	7 30		83 30	—26	.....			
	7 55		83 30	—26	.....	18 1,5		
	+ 9 8		83 20	—26	.....	18 10,7		
	9 30		83 30	—26	.....			
	10 10		83 30	—23	.....	18 10,5		
	10 30		83 30	—22	.....			
	11 18		83 30	—22	.....	18 9,3		
	11 50		83 30	—21	.....			
	0 4	P. M.	83 40	—21	.....	18 3		
	0 45		83 50	—20 $\frac{1}{2}$	.....			
	1 5		84 20	—20 $\frac{1}{2}$	.....	17 52,8		
	2 5		84 20	—20	.....	17 53,9		
	2 45		85 00	—19 $\frac{1}{2}$	.....			
	3 5		85 00	—19 $\frac{1}{2}$	.....	17 56,5		
	3 25		85 00	—19 $\frac{1}{2}$	.....			
	3 55		85 00	—19 $\frac{1}{2}$	.....	17 58,4		
	4 45		85 5	—19 $\frac{1}{2}$	.....	17 55,6		
	5 20		85 00	—21	.....			
	6 00		85 00	—22	.....	17 50,5		
	6 20		85 00	—23	.....			
	7 00		85 10	—23 $\frac{1}{2}$	.....	18 1,8		
	7 35		85 20	—24	.....			
	7 55		85 20	—24	.....	17 56,7		
	9 00		86 00	—24	.....	18 0,2		
	— 9 15		86 20	—24	.....			
	9 40	A. M.	86 00	—24	.....	17 58,5		
	11 00		86 15	—25	.....	17 59		
	Midn ^r		85 50	—26 $\frac{1}{2}$	.....	17 59		
	1 00		85 40	—26 $\frac{1}{2}$	.....	18 00,8		
	1 30		84 40	—26 $\frac{1}{2}$	.....			
	2 00		85 00	—27	.....	18 2,5		
	2 30		85 00	—27	.....			
	2 40		84 00	—27	.....			
	2 50		83 50	—26 $\frac{1}{2}$	.....			
	3 20		83 40	—27	.....			
	3 55		83 40	—27	.....	12 4,1		
	6 00		83 40	—27	.....	18 5,8		
	6 57		83 50	—27	.....	17 54,7	Calm	Clear and fine

Calm, clear and fine weather throughout the day.

Easterly Light

Ditto

North end of needle to the S. 85° W. The line of min. daily variation.

North end of needle to the S 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahr. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.			
							Winds.	Weather.	Remarks, &c.
1825. Mar. 25th	h. m.	P. M.	S 85° 00W	0	.....	m. s.			
	1 55		.....	-24	.....	17 54,9			
	2 45		.....	-23 $\frac{1}{2}$	.....	17 55,7			
	3 15		.....	-23 $\frac{1}{2}$	.....			
	3 50		.....	-23 $\frac{1}{2}$	.....	17 56,7			
	4 50		.....	-23 $\frac{1}{2}$	.....	17 54,3			
	6 00		.....	-26	.....	17 56,9			
	6 50		.....	-26	.....	17 56,2			
	7 36		.....	-26	.....			
	8 30		.....	-26 $\frac{1}{2}$	.....	17 57			
	9 00		.....	-26 $\frac{1}{2}$	.....	17 57,5			
	10 00		.....	-26 $\frac{1}{2}$	.....	17 56,3			
	11 00		.....	-27	.....	17 57,8			
	11 50		.....	-27	.....	17 58,3			
Mar. 26th	1 7	A. M.	.....	-26 $\frac{1}{2}$	.....	17 57,7	N. W. Fresh	Hazy	
	1 50		.....	-26	.....	17 58,2			
	2 15		.....	-26	.....			
	3 00		.....	-26	.....	17 59,7			
	4 00		.....	-26	.....	17 59,4			
	4 50		.....	-27	.....	18 2,0			
	6 00		.....	-26	.....	18 3,2			
	7 00		.....	-26	.....	18 3,7			
	7 40		.....	-26	.....	18 5,0			
	9 00		.....	-24	.....			
	10 00		.....	-24	.....	18 7,5			
	10 25		.....	-24	.....			
	11 2		.....	-23	.....	17 59			
	11 30		.....	-23	.....			
Mar. 27th	Noon	P. M.	.....	-21 $\frac{1}{2}$	Line of minimum effect.	17 58,8	North Mod.	Hazy	
	0 30		.....	-22 $\frac{1}{2}$	.....			
	1 10		.....	-22	.....	17 52,5			
	1 50		.....	-22	.....	17 52,3			
	2 55		.....	-21 $\frac{3}{4}$	.....	17 57,6			
	3 50		.....	-22	.....	17 58			
	5 15		.....	-22 $\frac{1}{2}$	.....	17 53,3	North Squally		
	5 50		.....	-22 $\frac{1}{2}$	.....			
	6 20		.....	-22 $\frac{1}{2}$	.....	17 54,5			
	7 10		.....	-23	.....	17 57,4			
	7 50		.....	-23	.....	17 56,7			
	9 5		.....	-23	.....	17 58,2			
	9 50		.....	-23	.....	17 57,2			
	10 50		.....	-23	.....	17 59,5	North Fresh	Clear	
	11 47		.....	-23	.....	17 59,8			
	1 00	A. M.	.....	-23	.....	18 1,0			
	1 30		.....	-23	.....		Hazy		
	1 55		.....	-23	.....	18 3			
	2 45		.....	-23	.....			
	3 50		.....	-23	.....	18 4,2			
	5 15		.....	-23	.....	17 58,9			
	5 50		.....	-23	.....	18 00			
	6 20		.....	-22	.....		Ditto	Clear	

Max. easterly var.

Max. westerly var.

Max. easterly var.

North end of needle to the S. 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
Mar. 27th	h. m.	A. M.	85 00 W	0	Line of min. effect.	m. s.	Hazy with snow	Max. westerly var.
	7 10		85 00 W	-22		17 59.3			
	9 00		85 00	-21		17 57.3			
	9 30		85 00	-21		18 5.5			
	10 10		85 00	-21		18 4.7			
	10 45		85 00	-20		18 4.2			
	11 10		85 00	-20		18 3.7			
	11 30		85 00	-18		17 57.2			
	12 10		85 00	-18		17 53.7			
	12 35		85 00	-18		17 55.5			
	1 15		85 30	-18		17 56.5			
	1 50		85 30	-18		17 57.8			
	2 00		86 00	-20		17 55.3			
	2 45		86 30	-20		17 56			
	3 15		86 30	-20		17 58.3			
	3 50		86 30	-21		18 7.9			
	4 00		86 30	-21		18 6.0			
Mar. 28th	4 45		86 30	-21		17 58.5			
	5 10		86 30	-21		18 7.2			
	5 45		86 30	-21		17 55.7			
	6 00		86 30	-21		18 3.7			
	6 30		86 30	-22		18 10.8			
	7 00		86 30	-22		18 10.4			
	7 30		86 30	-22		18 4.4			
	8 00		86 30	-22		18 1			
	8 30	P. M.	86 30	-21		.....		
	9 00		86 30	-21		.....		
	9 30		86 30	-21		.....		
	9 56		86 30	-21		.....		
	10 00		86 30	-20		.....		
	10 30		86 30	-20		.....		
	11 00		86 30	-20		.....		
	+ 11 30		86 30	-20		.....		
	1 00		86 30	-18		.....		
	1 15		86 30	-18		.....		
	1 30		86 30	-18		.....		
	1 45		86 30	-18		.....		
	2 00		86 30	-18		.....		
	2 30		86 30	-18		.....		
	2 50		86 30	-18		.....		
	3 22		86 30	-18		.....		
	3 45		86 30	-18		.....		
	5 30		86 30	-18		.....		
	6 00		86 30	-18		.....		
	6 30		86 30	-19		.....		
	7 00		86 30	-20		.....		
	9 5		86 30	-20		17 52.8			
	9 50		86 30	-20		17 56.3			
	10 20		86 30	-20		17 57.8			
	10 50		86 30	-20		.....		

North end of Needle to the S. 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
Mar. 28th	h. m.								
	11 15	P. M.	86 10W	—20 $\frac{1}{2}$	.....	m. s.			
	11 52		86 00	—21	.....	17 57,5			
	1 7	A. M.	86 10	—21	.....	17 58,8			
	1 52		86 20	—21	.....	17 59,3	East Light	Hazy	
	2 12		86 10	—21	.....	18 0,5			
	2 50		86 10	—22	.....	18 2,3			
	3 45		86 10	—22	.....	18 3,5			
	4 12		86 10	—22	.....	18 3,3			
	5 00		85 45	—23	.....			
Mar. 29th	5 30		84 30	—23	.....			
	7 00		84 50	—23	.....	17 57,5			
	7 30		84 50	—23	.....	18 4,7			
	9 10		84 40	—21	.....	18 0,8			
	9 46		84 30	—21	.....	17 57,5			
	10 12		84 20	—21	.....	17 51,2	Ditto	Ditto	
	11 5		85 10	—20	.....	18 14,3			
	11 40		84 40	—19	.....			
	0 7	P. M.	84 10	—19	.....	18 18			
	+ 1 2		84 00	—18 $\frac{1}{2}$	.....	17 46,7			
+	1 40		84 00	—18	.....			
	2 15		84 10	—17 $\frac{1}{2}$	.....	17 48,5			
	2 50		84 40	—17 $\frac{1}{2}$	.....			
	3 15		85 00	—17 $\frac{1}{2}$	.....	17 48			
	3 55		85 00	—17	.....	17 56,2			
	6 00		85 15	—19 $\frac{1}{2}$	.....	17 55,5	Easterly Light	Clear and fine	
	7 00		85 30	—21	.....	17 53			
	7 30		85 30	—21	.....			
	8 00		85 40	—22	.....	17 59,3			
	8 30		85 40	—22	.....			
Mar. 30th	8 50		85 40	—22	.....			
	9 12		86 30	—22	.....	17 58,5			
	10 14		86 30	—22	.....	17 59,7			
	10 46		86 20	—22	.....			
	11 20		86 20	—22	.....	18 1,3	Northerly	Clear	
	Midn ^t		86 00	—22	.....	18 2,8			
	0 8	A. M.	85 10	—22	.....		North	Clear	
	0 10		84 25	—22	.....			
	1 20		84 25	—22	.....	18 0,3			
	2 35		82 40	—22	.....	18 9,3			
	3 10		82 30	—22 $\frac{1}{2}$	.....	18 14,8			
	3 58		77 30	—23	.....	18 31,3			
	+ 5 00		75 00	—23 $\frac{1}{2}$	.....	18 24,2			
	6 00		78 28	—23 $\frac{1}{2}$	.....	18 11,5			
	6 10		79 00	—23 $\frac{1}{2}$	.....			
	6 40		78 30	—23 $\frac{1}{2}$	.....			
	7 00		78 00	—23 $\frac{1}{2}$	.....	18 13,5	Easterly Light	Clear and fine	
	7 15		79 00	—23 $\frac{1}{2}$	.....			
	7 20		80 00	—23 $\frac{1}{2}$	.....			
	7 30		81 00	—23	.....			
	8 00		81 00	—23	.....	18 11,4			

North end of Needle to the S 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.				
							Instr.	Winds.	Weather.	Remarks, &c.
1825. Mar. 30th	h. m.	A. M.	83 30W	0	m. s.
	10 00		83 30	-21	.....	18 10,3			
	10 10		85 00	-21	.....				
	10 30		80 20	-21	.....				
	10 50		83 30	-20 $\frac{1}{2}$	.....	17 46,7			
	11 20		88 40	-19	.....				
	11 40		88 00	-19	.....				
	Noon		85 00	-19	.....	17 54			
	0 50		88 00	-19	.....				
	1 10		88 10	-18	.....	18 11,3			
	1 48		88 00	-18	.....				
	2 36		87 40	-17	.....	17 57,2			
	— 3 00		89 10	-17	.....	17 57			
	5 10		88 30	-18 $\frac{1}{2}$	.....	17 58,1			
	5 45		87 40	-19	.....	17 53,7			
	6 15		87 10	-20	.....				
	6 50		86 50	-21	17 54,1	Easterly moderate	Hazy
	7 20		86 40	-21	.....				
	8 00		86 40	-21	.....	17 58,4			
	8 30		86 40	-21	.....				
	8 45		86 00	-21	.....				
	9 12		86 00	-22	.....	17 55,2			
	9 42		86 20	-22	.....				
	10 15		86 30	-22	.....	17 57,2			
	10 50		86 30	-22	.....				
	11 50		86 30	-22	.....				
Mar. 31st	Midn ^t	A. M.	86 30	-22	17 57,7	Ditto	Ditto	Max. easterly var.
	5 10		81 00	-24	.....	18 0,7			
	5 50		81 00	-24	.....				
	6 20		80 40	-24	.....	18 9,4			
	+ 6 55		80 30	-24	.....				
	7 15		81 00	-24	.....	18 4,4			
	8 00		83 20	-24	.....	17 55,8			
	9 6		83 50	-23	18 3	Ditto	Cloudy
	10 0		84 30	-22	.....	18 4,3			
	11 5		83 10	-21	.....	18 9,2			
	11 36		83 00	-21	To the left hand.					
	Noon		85 50	-21	..	18 1				
	— 0 30	P. M.	86 30	-21		Easterly	Light	Max. westerly var.
	1 10		86 20	-20	.....	17 58,8			
	1 50		86 20	-20	.....				
	2 15		86 20	-19 $\frac{1}{2}$	.....	17 53,7			
	2 50		86 20	-19 $\frac{1}{2}$	.....				
	3 12		86 20	-19 $\frac{1}{2}$	.....	17 58,5			
	3 56		86 20	-19 $\frac{1}{2}$	.....	17 58,2			
	8 00		86 20	-23	17 56,5	Easterly	Very Clear	D. on south meridian 19° altitude.
	9 00		86 30	-24	.....	17 57,7			
	9 56		84 55	-24	.....	17 55,5			
	10 30		84 55	-24 $\frac{1}{2}$	.....	17 56,5			
	11 00		85 00	-25	.....	17 56,5			
	Midn ^t		85 15	-25	.....	18 1			

Lieut. FOSTER's observations on the diurnal changes

North end of Needle to the S 85° W. The line of min. daily variation.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 1st	h. m.	A. M. S	° ' W	°	.....	m. s.	Easterly moderate	Clear	Max. easterly var.
	1 15		84 20	—25 $\frac{1}{2}$	.....	18 3,5			
	1 52		84 30	—25 $\frac{1}{2}$	.....	.....	
	2 18		84 20	—26	.....	18 9,7			
	2 50		84 00	—26	.....	18 15,5			
	3 20		84 00	—26 $\frac{1}{2}$	.....			
	3 56		84 00	—26 $\frac{1}{2}$	.....	18 4			
	6 00		82 30	—27	.....	18 10,8	Squally Moderate	Fine and	.....
	6 15		82 00	—27	.....		easterly	Clear	
	6 30		80 30	—27	.....			
	6 45		79 30	—27	.....			
	7 00		79 20	—27	.....	18 15			
	9 10		78 50	—24	.....	18 23,3			
	+ 9 50		78 00	—23	.....			
	10 15		81 30	—23	.....	18 9			
	10 45		83 20	—23	.....			
	11 6		87 10	—23	.. Irregular ..	17 55,3	.....	.....	The intervals of 10 vib ^g of the ho- rizontal needle were rapidly de- creasing between 11 ^h and 12 ^h A.M.
	11 20		90 00	—22	.....			
	11 32		90 00	—22	.....			
	11 45		87 30	—21	.....			
	o 8	P. M.	87 20	—20 $\frac{1}{2}$	.....	17 49,8	Easterly light	Clear and	.....
	1 00		83 30	—20	.....	17 49,7		Fine	
	1 49		90 00	—19	.....	17 43,8	.....	.....	Max. westerly var.
	2 30		89 20	—19	.....			
	3 12		88 15	—19	.....	17 55,7			
	4 00		87 30	—19	.....	17 54,3			
	5 00		88 50	—21	.....	17 44			
	6 00		87 00	—21	.....	17 55			
	6 30		85 00	—21	.....			
	7 30		87 40	—23	.....	17 45			
	8 00		88 00	—23	.....	17 52,3			
	9 6	A. M.	91 50	—23 $\frac{1}{2}$	.....	17 39,3			
	10 40		89 30	—23 $\frac{1}{2}$	.....	17 46,1			
	11 5		86 20	—23 $\frac{1}{2}$	.....	17 52,9	Easterly	Clear and	Max. easterly var.
	11 52		85 30	—25	.....	17 59,1	light	Fine	
	1 00		84 30	—26	.....	18 5,8	Easterly	Ditto	
	1 32		83 50	—26	.....		moderate		
	2 10		83 20	—26	.....	18 4,7			
	2 42		82 50	—27	.....			
	3 5		82 00	—27	.....			
	+ 4 2		81 40	—27	.....	18 4,5			
	5 00		82 00	—27	.....	18 8,8			
	6 00		82 10	—26 $\frac{1}{2}$	.....	18 57,3			
	8 00		—	—26 $\frac{1}{2}$	—	17 53,5			
	9 10		82 40	—24	..	18 17,5			
	9 47		83 00	—24	..	18 0,7			
	10 12		83 30	—24	..	17 57,5	Ditto	Hazy	
	11 5		84 20	—23	.. To the left hand ..	17 56			
	11 10		85 00	—23	..				
	11 45		85 00	—23	..	17 33,8	Squally	.....	Max. westerly var.

North end of Needle to the S 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren ^{t.}	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 2d	h. m.	P. M.	S 86 40' W	0	.....	m. s. 17 46			
	1 4		87 30	—23					
	1 30		88 00	—22					
	1 50		88 00	—22					
	2 15		88 00	—22					
	2 50		88 00	—22					
	3 12		88 00	—22					
	3 55		87 20	—22					
	5 6		86 30	—23					
	6 00		84 50	—23					
	7 5		84 50	—23					
	—		—	—23	—	—			
	9 5		85 45	—23					
	10 2		86 10	—23					
	10 50		86 10	—23					
	Midn ^t		86 10	—24					
	1 12	A. M.	84 00	—24					
	1 55		83 30	—24					
	2 35		83 30	—24					
	3 10		83 20	—24					
	3 50		82 30	—24					
	—		—	—24	—	—			
	+ 9 00		77 20	—23					
	9 30		79 00	—23					
	10 5		82 30	—22					
	10 48		81 10	—22					
	11 22		80 10	—21					
	0 10	P. M.	82 30	—21	.. To the left hand. ..	..		
	0 13		87 00	—21					
	0 15		87 24	—21					
	1 6		90 30	—21					
	1 40		91 5	—20					
	3 00		86 55	—19					
	3 30		86 00	—18					
	5 2		86 00	—19					
	5 30		86 30	—19					
	6 00		87 00	—19					
	6 25		87 00	—20					
	6 50		87 00	—20					
	7 20		86 30	—20					
	7 54		86 10	—21					
	9 10		86 30	—21					
	10 2		86 20	—21					
	11 15		86 20	—22					
	Midn ^t		86 20	—22					
	5 20	A. M.	85 00	—23					
	5 50		85 00	—23					
	6 15		84 30	—23					
	6 52		84 00	—23					
	7 00		84 00	—23					
	7 10		83 00	—23					

North end of Needle to the S 85° W. The line of minimum daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 4th	h. m.	A. M.	S 82 00 W	—21°	..	m. s. 18 12,3			
	9 10		82 00	—21	..				
	9 52		83 40	—21	..				
	10 15		84 50	—21	..	18 1,5			
	11 5		85 30	—21	..	18 1,5			
	0 5		85 40	—19	..	18 2			
	— 1 10		91 00	—18	..	17 43,5			
	1 20		91 00	—18	..				
	1 50		89 10	—18	..				
	2 10		89 00	—18	..				
	2 45		89 00	—18	..				
	3 8		86 50	—18	..	17 58,1			
	3 25		86 50	—17	..				
	3 54		86 10	—17	..	18 2,7			
	5 00		86 10	—18	..	18 00			
	5 30		86 30	—18	..				
	6 00		86 30	—19 $\frac{1}{2}$	..	17 55			
	7 00		86 30	—20	..	17 54			
	9 00		86 30	—22	..	17 54			
	9 55		86 30	—23	..				
	10 15		86 25	—23	..	17 56,2			
	11 00		86 25	—23	..				
	11 16		86 25	—23	..	17 57,4			
	11 50		86 00	—23	..				
April 5th	1 7	A. M.	86 00	—24	..	18 0,3			
	2 5		85 40	—24	..	18 2,3			
	3 0		85 30	—25	..	18 2,8			
	4 2		85 00	—25	..	18 3,3			
	5 30		85 00	—25	..	18 7,5			
						17 58			

North end of Needle to the N 85° E.

Both magnets were placed to the south of the compass; the distance from the centre of the box, to the nearest end of the magnet, attracting the north end of the needle, was 18,98 inches, and to the nearest end of the other, attracting the south end of the needle, 27 inches. The needle now made 1 vibration in 9,5 seconds, the directive force being reduced in the ratio of 0,35 to 1 nearly.

April 5th	6 00	A. M.	N 85 0 E	—25	..	17 59,5	Easterly light	Clear and fine.	rising ENE. (true.)
	7 00		85 10	—25	..	18 6,2			
	7 30		84 30	—25	..	18 1,5			
	8 56		84 00	—22	..	18 1,8			
	9 15		83 50	—22 $\frac{1}{2}$	..	18 1			
	9 30		83 20	—21 $\frac{1}{2}$	..	..	
	10 00		82 30	—21 $\frac{1}{2}$	..	18 0,2			
	10 15		84 30	—21	..				
	10 50		86 00	—20	..				
	11 00		85 30	—20	..				
	11 30		84 30	—19	..	18 6,4			

North end of Needle to the N 85° E.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.			
							Winds.	Weather.	Remarks, &c.
1825. April 5th	h. m.								
	11 35	A. M.	N 83 00 E	—19°			m. s.		
	11 40		82 00	—19					
	11 50		81 00	—19					
	11 55		80 30	—19	.....	.....	
	Noon		80 00	—19	.....	17 47,6	.....	
	+ 0 45	P. M.	79 50	—18					
	1 00		79 50	—18	.....	17 51,6			
	1 30		80 00	—18					
	2 00		80 00	—18	.....	17 56			
	2 30		80 30	—18½					
	2 40		79 50	—17	.....	17 55,2			
	3 30		80 50	—17					
	3 58		81 50	—17	.....	17 57,1			
	5 30		82 00	—20	.....	17 55,8			
	6 00		81 50	—21	.....	17 55			
	7 00		81 50	—21	.....	17 50			
	9 00		81 40	—23	.....	18 2,2			
	9 45		81 40	—23					
	10 20		81 40	—23½	.....	18 2,9			
	10 50		81 50	—23					
	11 15		82 10	—24	.....	18 00			
	11 54	A. M.	82 40	—24	.....	18 1,6	.....	
	1 5		83 00	—25	.....	18 6,8	Easterly light.		
	1 55		83 25	—25					
	2 5		83 50	—25	.....	18 6,2			
	2 7		84 00	—25					
	3 0		84 10	—26	.....	18 9,3			
	3 50		84 25	—26					
	5 6		84 35	—26	.....	17 54,4			
	5 58		85 10	—26					
	7 10		85 30	—26	.....	18 3			
	7 15		87 00	—26	.....	18 7,8	ENE mod. & clear		
	7 30		87 30	—26	.....	18 9,7			
	7 55		87 30	—25	.....			
	9 00		87 30	—23½	.....	18 15,5	Easterly light		
	9 30		87 20	—23½					
	10 00		87 10	—22	.....	18 11,8			
	10 30		87 30	—22					
	11 00		87 30	—22	.....	18 9,2	.....	
	11 35		87 20	—21					
	Noon		87 20	—20	.....	18 2,6			
	o 30	P. M.	87 10	—19					
	o 40		85 40	—19					
	1 00		84 50	—19½	.....	17 56,1			
	1 30		84 50	—19½					
	1 55		84 40	—19½	.....	17 59			
	2 15		84 40	—19½					
	2 50		84 40	—19½	.....			
	3 15		84 30	—19½	.....			
	3 56		84 10	—19½	.....	18 0,4			
						18 1,7	.....	

Lieut. FOSTER's observations on the diurnal changes

North end of Needle to the N 85° E.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 6th	h. m.	P. M.	N 84° 10' E	°	.....	m. s.			
	5 10		84 00	—20	.....	18 1,8			
	6 6		84 00	—21	.....	17 56			
	6 50		84 10	—21	.....	17 56,7			
	7 48		84 20	—22	.....	17 55,7			
	+ 9 00		83 30	—22	.....	18 3,3			
	10 00		83 30	—23	.....	18 0,3			
	10 30		83 30	—24	.....			
	11 00		83 30	—24	.....	18 00	Easterly light	Clear and fine.	
	11 30		83 30	—24	.....			
	Mid ^t .		83 30	—24 ¹	Irregular.	18 2,5			
	1 10	A. M.	83 30	—25	.....	18 1,1	Easterly light	Clear and fine.	
	1 50		83 30	—25	.....	18 4,6			
	2 30		83 30	—25	.....			
	3 3		83 30	—25	.....	17 58,7			
	3 50		84 00	—25	.....	17 58,5			
	5 00		84 20	—25	.....	17 56,6			
	6 00		84 15	—25	.....	18 0,7			
	7 00		84 35	—24	.....	18 6,1			
	7 55		84 55	—23	.....	18 1,2			
	9 10		84 30	—23	.....	18 5			
	9 50		84 30	—22	.....	18 6,5			
	10 11		84 30	—21	.....			
	11 2		84 30	—20	.....	18 7,2			
	11 51	P. M.	84 30	—19	.....			
	Noon		84 30	—18 ¹	.....	18 8	Ditto	Ditto	
	0 30		84 30	—17 ²	.....			
	1 00		83 30	—17	.....	17 55,2			
	1 30		82 20	—16 ¹	.....			
	2 00		82 00	—16 ²	.....	17 53,5	.....	.....	Max. westerly var.
	2 30		81 30	—16 ¹	.....			
	3 00		81 30	—16 ²	.....	17 57			
	5 00		81 25	—17	.....	17 53			
	5 30		81 10	—18	.....			
	+ 6 10		81 5	—19	.....	17 52,8			
	6 30		81 5	—19	.....			
	7 10		81 5	—20	.....	17 52,6			
	7 30		81 10	—20	.....			
	7 52		81 35	—20	.....			
	7 55		81 40	—20	.....	17 56,6			
	9 10		81 50	—20	.....	18 1,8			
	10 6	A. M.	82 00	—21	.....	17 59,7			
	11 10		82 20	—21	.....	18 1,5			
	11 56		82 15	—22	.....	18 1,5			
	1 00		83 30	—22	.....	17 59	Easterly light	Clear and fine	Max. easterly var.
	1 10		84 30	—22	.....			
	1 40		84 30	—22 ¹	.....			
	2 10		85 00	—22	.....	18 9			

North end of Needle to the NE.

The magnets were now placed to the north and south of the needle, with their axes slightly inclined to the magnetic meridian; the north magnet had its north pole towards the compass-box, at the distance of 29,1 inches from its centre, and the south magnet had its south pole towards the compass-box, at the distance of 30,1 inches from its centre: the time in which the needle now performed 1 vibration, was 14,4 seconds; so that the directive force was reduced in the ratio of 0,15 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.	
1825. April 8th	h. m.	A. M.	0 , N 45 30 E	0	18 1,3	East Fresh	Clear and Fine	It will be seen that, at the time of the greatest westerly var. an increase of directive power in the horizontal needle took place, which accounts for the great expression of 50° for the daily variation.	
	5 10		45 20	-23		18 9,2				
	5 55		45 20	-22		18 12,3				
	6 30		45 20	-22		18 3,4				
	6 55		45 20	-22		17 58,8				
	7 20		45 20	-21 $\frac{1}{2}$		18 22,8				
	7 50		44 10	-21 $\frac{1}{2}$						
	8 00		43 50	-21 $\frac{1}{2}$						
	9 26		42 20	-20						
	9 28		42 00	-20						
	10 10		41 50	-20						
	10 30		41 30	-20						
	11 10		41 10	-19	To the right hand.	18 6				
	11 30		41 00	-18 $\frac{1}{2}$						
	Noon	P. M.	36 10	-18 $\frac{1}{2}$		17 51,8				
	0 15		35 00	-18 $\frac{1}{2}$						
	0 30	+ 1 10	29 00	-18 $\frac{1}{2}$						
	1 00		1 30	-17		17 56,2	Max. west. var.		
	2 00		10 10	-17		17 50,5				
	2 50		16 30	-17						
	3 10		17 00	-17		17 44	Ditto moderate	Clear and Fine		
	3 47		17 40	-17		17 53				
	5 5		25 30	-17		17 43,5				
	5 30		25 30	-17						
	6 00		27 30	-17		17 37				
	6 20		27 30	-18						
	6 35		32 00	-19						
	7 10		33 30	-19		17 41,5				
	8 00		37 00	-19		17 34,7				
	9 30		40 00	-20		17 44,6				
	10 00		40 00	-20		17 45,4				
	10 35		40 00	-20						
	11 12		45 10	-20 $\frac{1}{2}$			Easterly Light	Hazy	Max. east. var.	
	—Midn ^t		51 30	-20 $\frac{1}{2}$						

North end of Needle to the N.E.

The situation of the magnets, in this case, was the same as in the preceding observations at N.E.; except that their ends nearest to the needle were 29,7 inches from the centre of the compass-box: the needle making 1 vibration in 12 seconds, the directive force was reduced in the ratio of 0,22 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.			Remarks, &c.
							h. m.	m. s.	Weather.	
1825. Apr. 9th	1 00	A. M.	N 54 00 E	—20 ₁ ₂	18 4	Easterly moderate	Hazy		
	2 00		54 00	—20 ₂	.....	17 7,3			
	3 12		53 50	—20 ₂	.....	18 8,2			
	3 48		53 50	—21	.....				
	4 8		53 30	—20	.....	18 7,5			
	5 00		53 00	—20	.....	18 12			
	6 00		52 00	—20	.....	18 8			
	6 30		51 30	—20	.....				
	7 00		51 00	—20	.....	18 8,2			
	7 30		50 40	—20	.....	18 7,5			
	9 00		50 20	—18 ₁ ₂	.....	18 9,7			
	9 35		44 50	—18 ₁ ₂	.....				
	9 50		44 10	—18 ₁ ₂	.....	18 9,2			
	10 15		44 10	—18	.....				
	10 45		44 00	—17 ₁ ₂	.....				
	11 10		44 00	—17	.....	18 16,1			
	11 45	P. M.	43 40	—17	.....				
	12 8		43 00	—16 ₁ ₂	.....	18 9,7			
	1 5		38 55	—16	.....	17 58,5			
	1 30		38 40	—16	.....				
	2 10		38 30	—16	.....	17 53,9			
	2 30		38 15	—15	.....				
	3 10		38 00	—16	.....	17 47,8			
	+ 3 50		34 00	—16	.....	17 41,4			
	5 00		34 00	—17	.....	17 41,5			
	6 00		34 00	—17	.....	17 55			
	6 30		34 00	—17	.....				
	7 00		34 00	—17	17 43	Ditto	Overcast	Max. westerly var.	
	8 00		34 00	—17	.....	17 50,2			
	9 10		34 20	—18 ₁ ₂	.....	17 47,2			
	9 45		35 20	—19	.....				
	10 5		35 30	—19	17 54,4	Easterly moderate	Hazy		
	10 35		35 50	—19 ₁ ₂	.....				
	11 7		36 00	—19	.....	17 55,4			
	11 34		36 30	—19	.....				
	11 56		37 30	—19	.....	17 56,5			

North end of Needle to the N E.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibr. tions.	Winds.	Weather.	Remarks, &c.
1825. Apr. 10th	1 13	A. M.	N 42° 50' E	—19°	m. s. 17 57.5	Easterly moderate	Hazy	Max. easterly var.
	1 15		44 50	—19	.....	18 3.8		
	1 16		45 30	—19	.....	18 11		
	1 17		46 00	—19	.....	18 4.4		
	1 58		47 00	—18 ¹	.....	18 14.5		
	2 11		47 30	—18 ²	.....	18 13.3		
	2 55		51 40	—18	.....	18 17.7		
	3 50		53 00	—18	.....	18 10		
	5 10		52 20	—18	.....	17 53.5		
	6 4		52 20	—18	.....	17 58.5		
	7 2		52 40	—17	.....	17 55.6		
	7 50		52 20	—17	.....	18 3.5		
	8 10		52 20	—16	... To the right hand.	18 37.9			
	9 00		52 00	—16	... To the right hand.	17 48.2			
	10 00		51 00	—16	... To the right hand.	17 56.8			
	10 30		46 30	—15 ¹	... To the right hand.	17 59.2			
	11 00		41 00	—15	... To the right hand.	17 58.7			
	11 30		40 00	—14 ²	... To the right hand.	18 0.5			
	+ Noon	P. M.	38 40	—14 ³	... To the right hand.	18 3.5	E S E Strong	Much snow drift and thick weather.	Max. westerly var.
	1 00		39 00	—14	... To the right hand.	17 37.9			
	1 32		40 20	—14	.....	17 48.2		
	2 00		40 20	—14	.....	17 56.8		
	2 32		40 20	—13 ¹	.....	17 59.2		
	3 00		39 40	—13 ¹	.....	17 58.7		
	3 34		39 00	—13 ²	.....	18 0.5		
	3 55		39 00	—13 ²	.....	.....	
	5 7		39 00	—13	.....	.....	
	6 6		39 10	—13	.....	.....	
	7 5		39 10	—13	.....	.....	
	7 46		39 00	—13	.....	.....	

The direction of the Needle was not registered after 7^h 46^m P. M. in consequence of the severity of the weather: Gale of wind from eastward, and much snow drift.

North end of Needle to the S. E.

The needle was held in equilibrio at this point by two bar magnets; one to the North, with its nearest end from the centre of the compass 26.3 inches; the other to the South, having its nearest end from the centre of the compass 26.6 inches; the axis of each magnet was slightly inclined to the meridian, and the needle under their influence made 1 vibration in 11.2 seconds, the directive power being reduced in the ratio of 0.24 to 1 nearly.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.	
1825. Apr. 12th	h. m.	A. M.	44 00 E	°	m. s. 18 17,4	E S E Fresh	Hazy	Max. easterly var. took place at 0 ^h 3 ^m A. M.	
	6 30		43 30	+ 3	.....	18 20,3			
	7 00		43 10	+ 4	.....	18 16,5			
	8 00		43 00	+ 5	.....	18 19,6			
	9 32		42 55	+ 6	18 12,2	East moderate	Snow falling		
	10 15		42 30	+ 6	.....	18 10,3			
	10 32		42 10	+ 7	To the left hand.	18 8,7				
	11 7		42 00	+ 7	.....	18 6,2			
	11 30		41 55	+ 7	17 59,7	Squally	Much drift	Max. westerly var.	
	11 32		41 55	+ 7	.....	18 56,3			
	11 33		41 55	+ 7	.....	17 58			
	0 5	P. M.	41 55	+ 7	.....	18 24,8			
	1 10		42 00	+ 6	.....	18 21,5			
	2 7		42 00	+ 5	.....	18 22,8			
	+ 3 8		41 50	+ 5	.....	18 25,8			
	3 57		41 50	+ 5	.....	18 23,1			
	5 00		42 10	+ 5	18 21,2	Easterly moderate	Cloudy	Max. easterly var.	
	5 30		42 40	+ 5	.....	18 18,5			
	6 00		42 40	+ 5	.....	18 14,5			
	6 30		42 40	+ 5	.....	18 11			
	7 00		42 40	+ 4	.....	18 10,2			
	8 00		42 40	+ 4	.....	18 7			
Apr. 13th	10 2	A. M.	50 30	+ 4	.....	18 14			
	11 10		50 30	+ 4	.....	18 14,5			
	11 55		50 30	+ 4	.....	18 11			
	1 7		50 0	+ 3	.....	18 10,2			
	2 5		49 30	+ 2	.....	18 7			
	3 6		50 30	+ 1	.....	18 6,2			
	4 0		51 30	- 1	.....	18 5			
	5 30		49 5	- 1	.....	18 22,8			
	6 00		48 30	- 1	.....	18 21,5			
	6 30		48 00	- 1	.....	18 21,2			
	7 00		47 00	Zero	.....	18 20,8			
	7 30		46 20	Zero	To the left hand.	18 20,5				
	8 00		—	—	.....	18 20,2			
	9 00		44 00	+ 0	.....	18 25,8			
	9 50		43 50	+ 0	.....	18 23,1			
	10 10		41 00	Zero	.....	18 21,2			
	10 30		36 00	Zero	.....	18 11,8			
	+ 11 10		35 40	+ 1	.....	18 8,4			
	11 30		36 5	+ 1	.....	17 58,6			
	1 5		37 00	+ 1	.....	17 58,6			
	1 30		37 00	+ 1	.....	17 58,6			

North end of Needle to the S E.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.			Remarks, &c.
							Winds.	Weather.	
1825. Apr. 13th	h. m.	P. M.	S 37 00 E	0	.....	m. s.	.		
	2 15		37 00	+ 1	.....	17 59			
	3 30		37 00	Zero	.....	17 55,6			
	5 30		44 30	— 2	.....	17 54			
	6 00		46 00	— 2	.....	17 59,5			
	6 15		47 10	— 2	.....	17 56,5			
	6 30		50 00	— 2	.....			
	7 00		50 00	— 4	.....	17 58,5			
	7 30		50 00	— 4	.....			
	9 5		49 30	— 5 $\frac{1}{2}$	.....	18 2,5			
	9 45		49 00	— 6 $\frac{1}{2}$	.....			
	10 10		47 20	— 7	.....	18 5,6			
	11 00		47 20	— 7	.....	18 2,5			
	11 30		47 10	— 7	.....			
Apr. 14th	Midn ^t		47 00	— 7	.....			
	1 10	A. M.	46 30	— 7 $\frac{1}{2}$	.....	18 3,3	Fresh	Cloudy	
	1 30		46 20	— 8	.....	18 14,0	North	overcast	
	2 10		45 10	— 8	.....		E S E	Cloudy	
	3 7		44 10	— 9	.....	18 20,8	Fresh		
	3 50		43 55	— 9	.....	18 22,8	Squally	Thick with drift, zenith clear	
	5 10		43 40	— 9	.....	18 5,7			
	6 00		43 40	— 9	.....	18 22,7			
	7 10		43 40	— 9	.....	18 14,5			
	7 35		43 40	— 10	.....	18 8,8			
	7 50		43 20	— 10	.....			
	9 30		41 30	— 9	.....	18 6			
	10 00		38 40	— 9	.....	18 2,7			
	10 30		38 30	— 9	.....	18 18,5	N. Easterly	Hazy	
	11 00		43 30	— 9	.....		Squally		
P. M.	11 30		44 40	— 8	.....	17 56			
	0 5		37 50	— 6	To the left hand.				
	0 20		30 00	— 6	.....	18 5			
	0 30		28 45	— 6	.....			
	+ 0 48		25 10	— 5 $\frac{1}{2}$	.....			
	1 20		35 10	— 5 $\frac{1}{2}$	.....	17 57			
	2 00		39 00	— 5	.....	18 2			
	2 30		32 10	— 4	.....			
	3 00		38 20	— 4	.....	17 48			
	4 00		39 30	— 4	.....	17 48,2			
	5 10		42 00	— 4	.....	17 40,5			
	5 50		51 10	— 5	.....	17 26,8			
	6 50		49 30	— 6	.....	17 35,7	Northerly	Hazy	
	7 10		50 20	— 7	.....		Squally	low down	
	7 48		51 00	— 8	.....	17 25,2			
	9 30		52 30	— 8	.....	17 44			
	10 00		57 10	— 8	.....	17 50,7			
	10 30		62 00	— 9	.....			
	11 00		59 30	— 9	.....	18 00			
	11 30		58 20	— 9	.....			
	11 40		56 20	— 9	.....		Fresh and	Clear	
	Midn ^t		54 00	— 9 $\frac{1}{2}$	.....	18 6,5	Squally	over head	

March 22nd. North end of Needle to the S. 83° W.

THE following summary of the observations at this point, is given here, merely to prevent breaking the preceding series: they were commenced at 6 o'clock in the morning, at which time the north end of the needle was at S. 83° 30' W. where it remained until $\frac{1}{2}$ past 9^h; it then moved to S. 85° W. and became nearly stationary until about 11^h 30^m, at which time it was at S. 81° 30' W. and soon after, I observed it vibrating rapidly in very small arcs, which were continued with different degrees of intensity for the space of a quarter of an hour. During this time, simultaneous observations on the times of vibration of a horizontal needle were made, and as great fluctuations were observed in the intervals of 10 vibrations, I have inserted them in detail, as follows, in order to show the variations of horizontal intensity which take place in short intervals, and to which must be attributed the irregular vibratory motion observed in this needle.

Mean Time of Observation.	Intervals of 10 vibrat.	Remarks.
h. m. s.	m. s.	
11 38 5,2	3 4,8	It appears by these observations, that the intervals of 10 vibrations, exhibit changes of horizontal intensity to the amount of $\frac{1}{5}$ th part of those intervals, in the space of quarter of an hour.
41 10	3 3	
44 13	3 3,5	
47 16,5	3 2,5	
50 19	3 1,7	
53 20,7	3 1,8	
56 22,5		

IN the foregoing observations, when the north end of the needle was directed towards the east or west points of the compass, it will be seen, that the various deflections of the needle rendered it difficult to discover which way its north end had proceeded during the time of westerly daily variation.

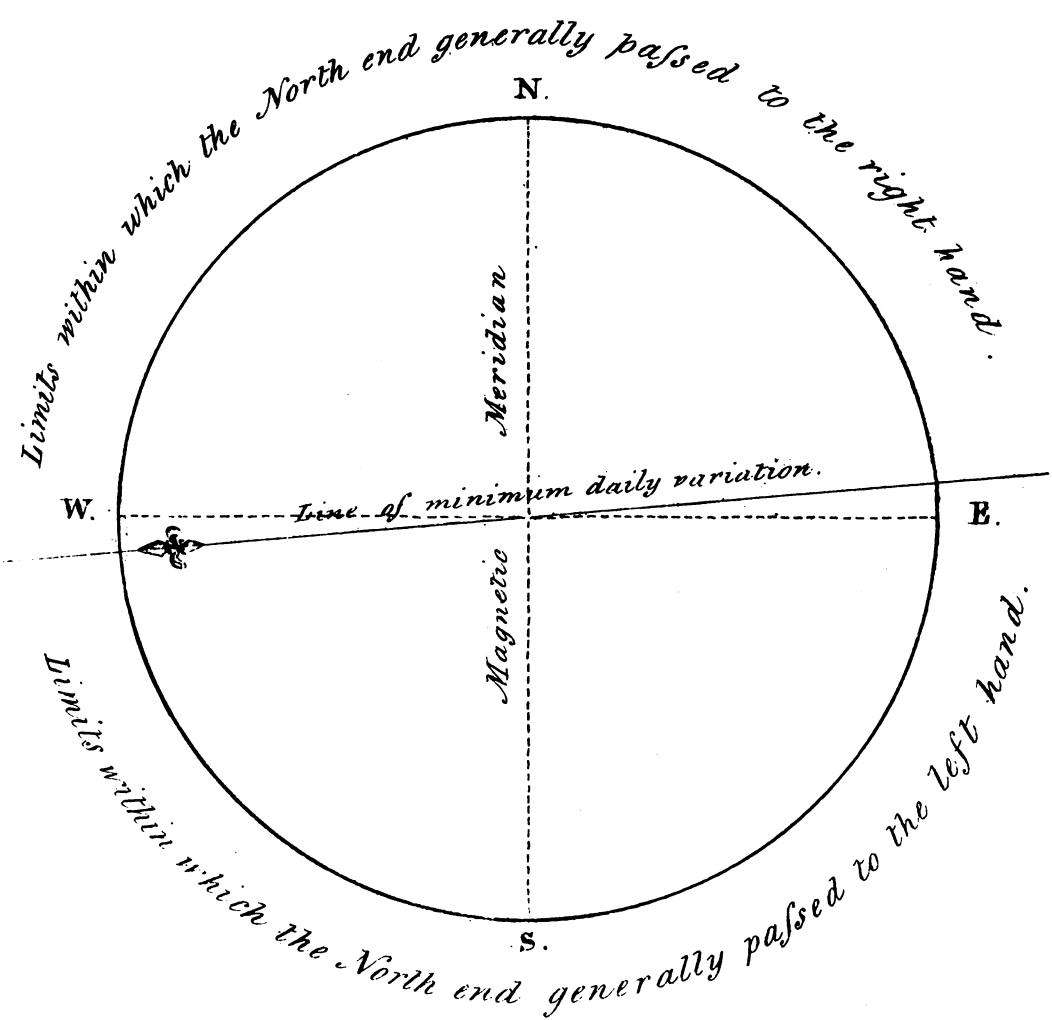
This anomalous action of the needle exhibited itself so strongly on the 23d of February, that I was induced to compare the nature of some of its deflections, with simultaneous observations, on the times of vibration of a freely suspended horizontal needle ; and as I found, in every instance of comparison, a decided relation between the changes of horizontal intensity, and these deflections, I began to watch the action of this needle more closely, at the times that fluctuations in the directive force of the horizontal needle, had hitherto been observed to take place ; and from its indications, I frequently stated to the Gentlemen making the observations on horizontal intensity, what I considered would be the nature of the intervals they were about to obtain ; which proving correct, no longer left any doubt on my mind, of the cause of these apparent irregularities. In order, however, to point out more satisfactorily the relation between the changes of horizontal intensity, and the various deflections of this needle, at other positions of its north end, I have annexed the observations on the times of performing 60 vibrations by a horizontal needle, taken during the same time ; but this will not explain all the anomalies alluded to, without also stating, that the fluctuations which frequently took place in the intervals of 10 vibrations, were sometimes observed to compensate one another, so as, in the mean of sixty, to leave no

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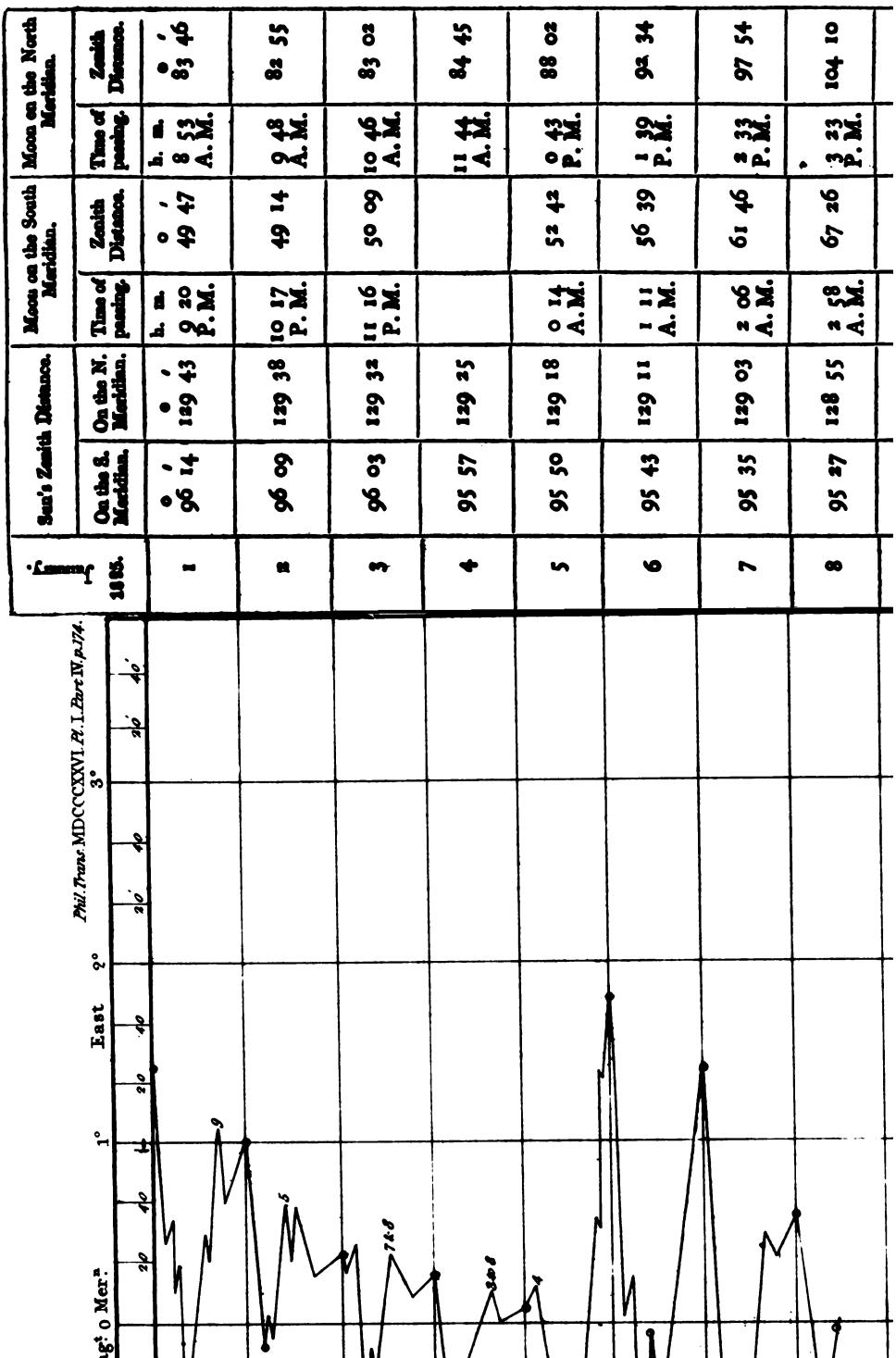
indications of such changes having taken place; and it is only on these occasions, that the expression for the magnetic intensity of the horizontal needle is at variance with the irregular motion of the neutralized needle.

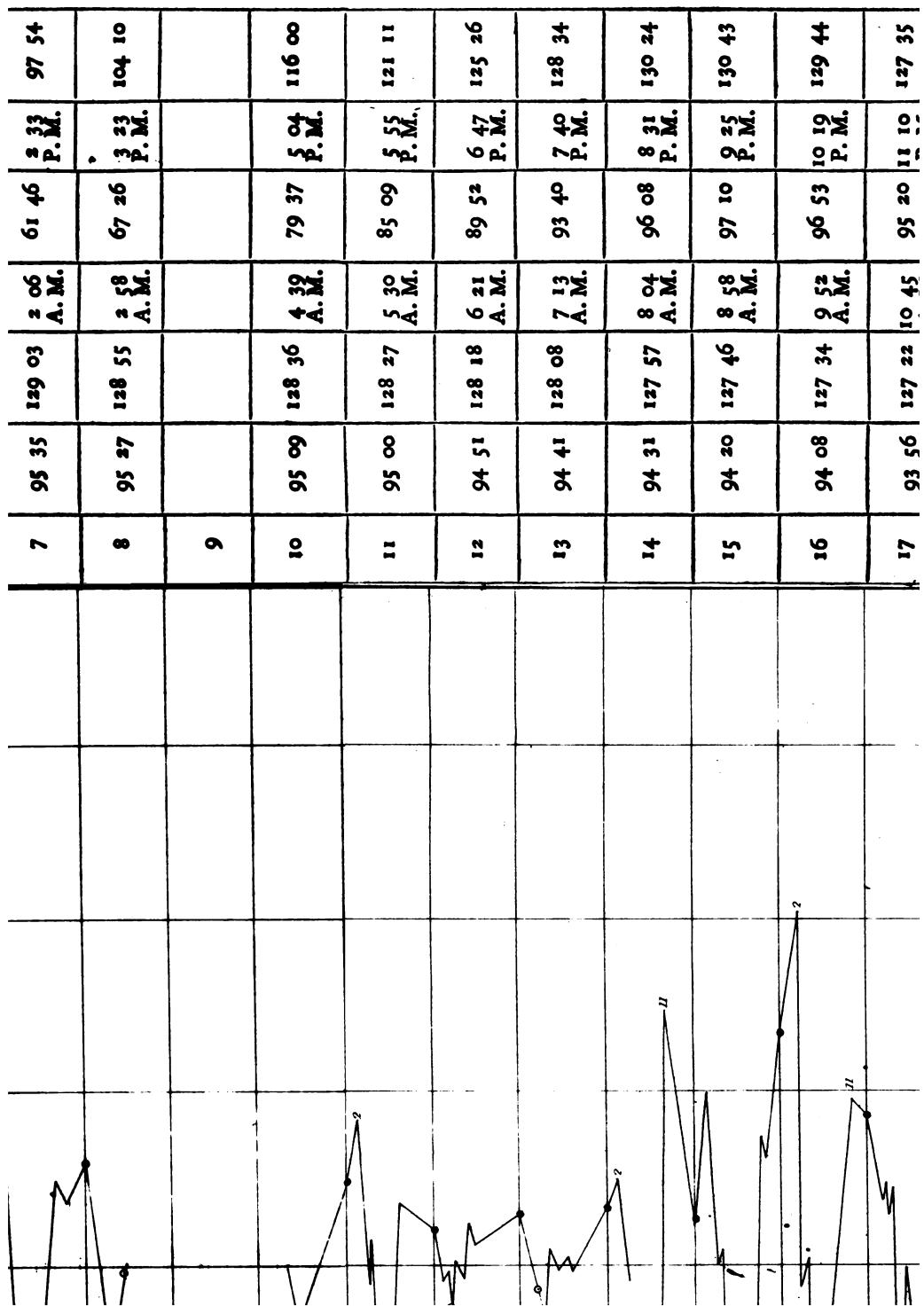
On looking over the observations it will also be seen, that when the north end of the needle was directed to the southward, between N. 85° E. and S. 85° W. its motion during the time of westerly daily variation was generally towards the *left hand*, but when directed to the northward, between N. 85° E. and S. 85° W. its motion was then most commonly to the *right hand* (see the figure in Plate IV.); and that when held between N. 85° E. and north, a greater daily change obtained than at any of the other positions, amounting in one instance to 50 degrees; but when directed to S. 85° W. no daily variation, or at least a minimum, exhibited itself.

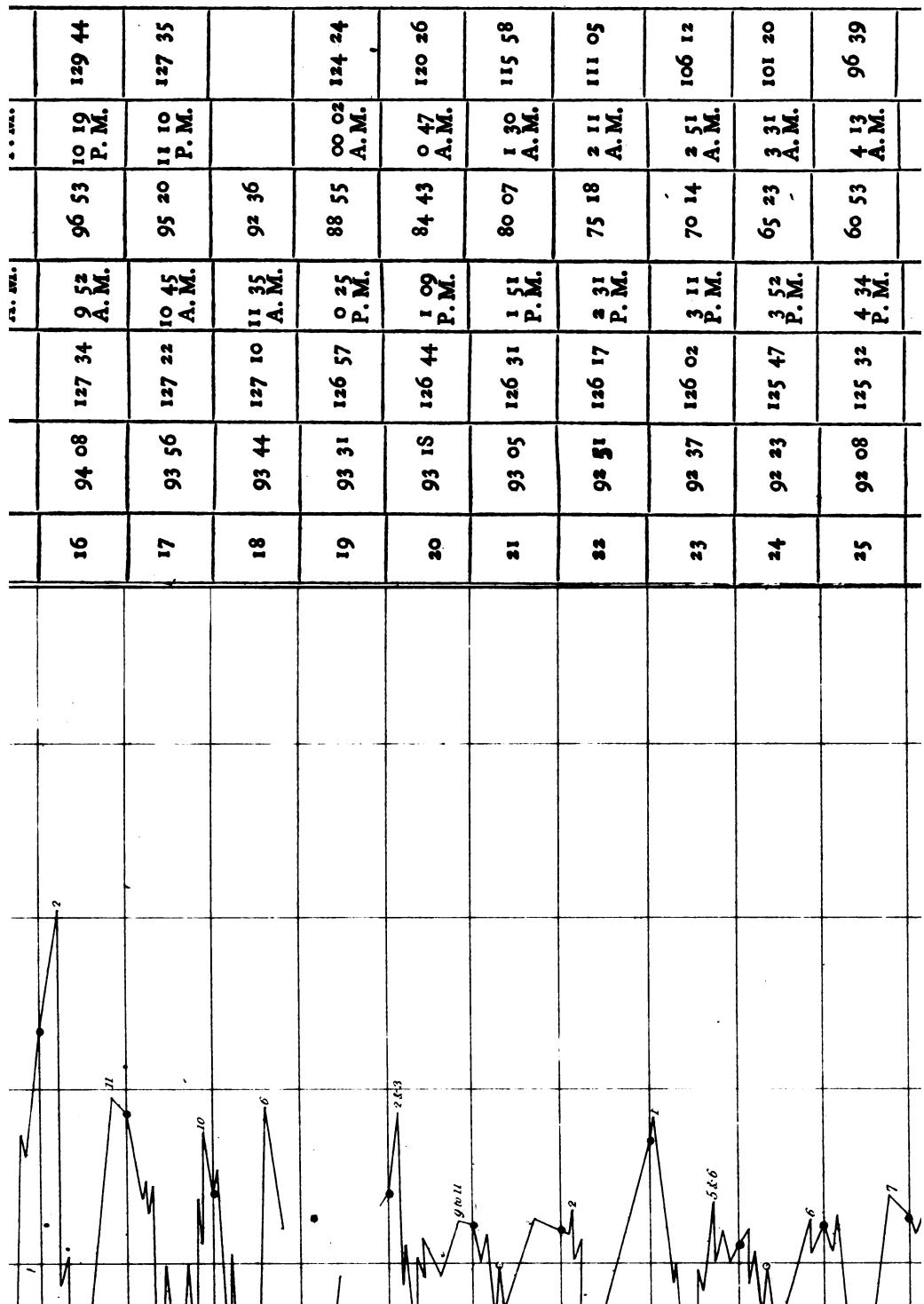
With respect to the effect produced on the needle when held between N. 85° E. and north, it appears, from observations on the times of vibrations of a horizontal needle, that an increased intensity generally took place about noon, at which time also, the maximum westerly daily variation generally happened; and as we have already seen, that the motion of the north end of the needle in this position, during the time of westerly daily variation, was to the *right hand*, or towards the magnetic meridian, the effect of an increased intensity would be to draw it still further in that direction, and therefore, produce the extraordinary amount noticed. But with the north end of the needle, held between S. 85° W. and north, where its motion is still to the *right hand* at the time of westerly daily variation, the effect of increased intensity then, would be to draw the north end of the needle to the

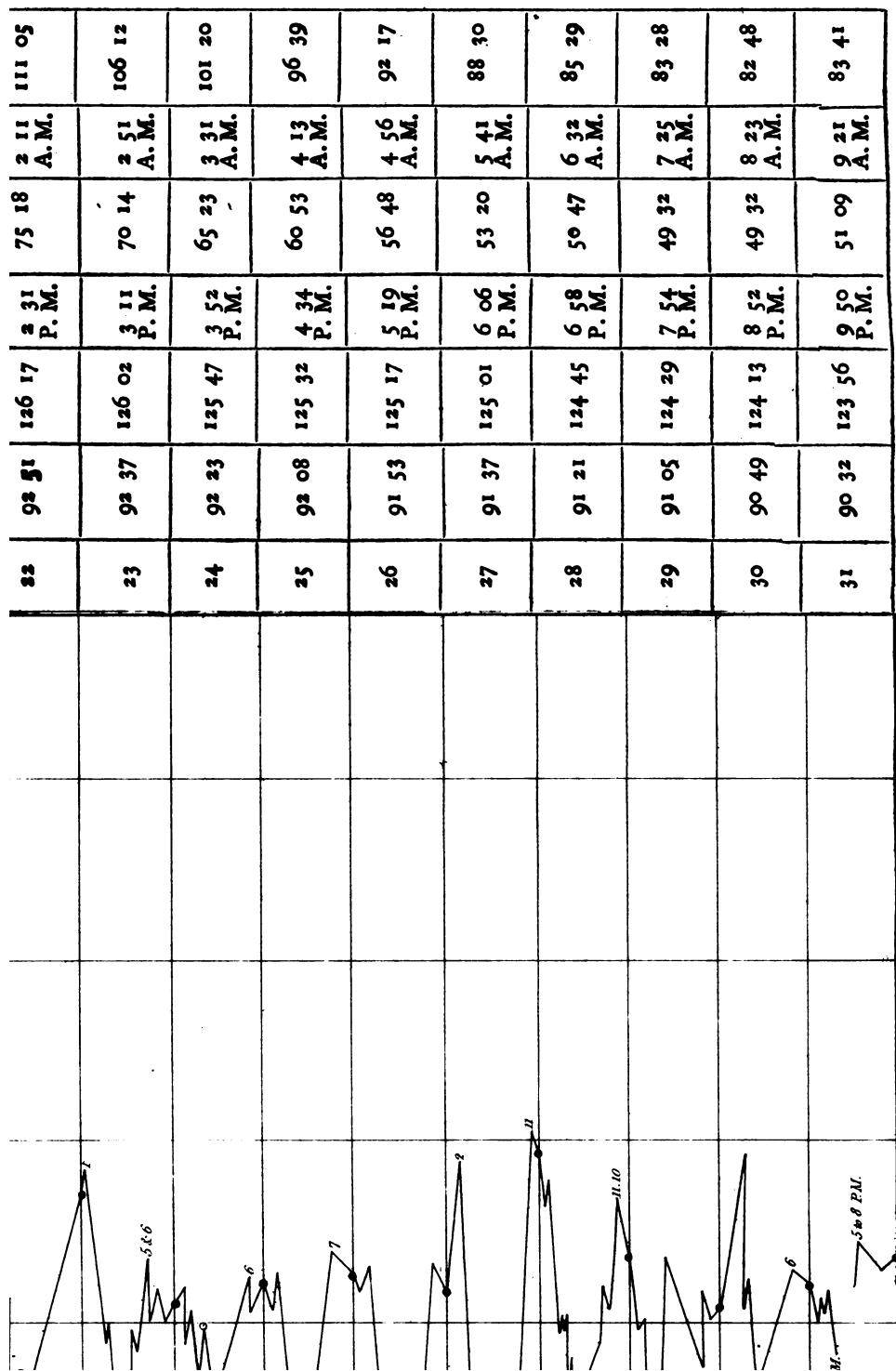


Needle I.



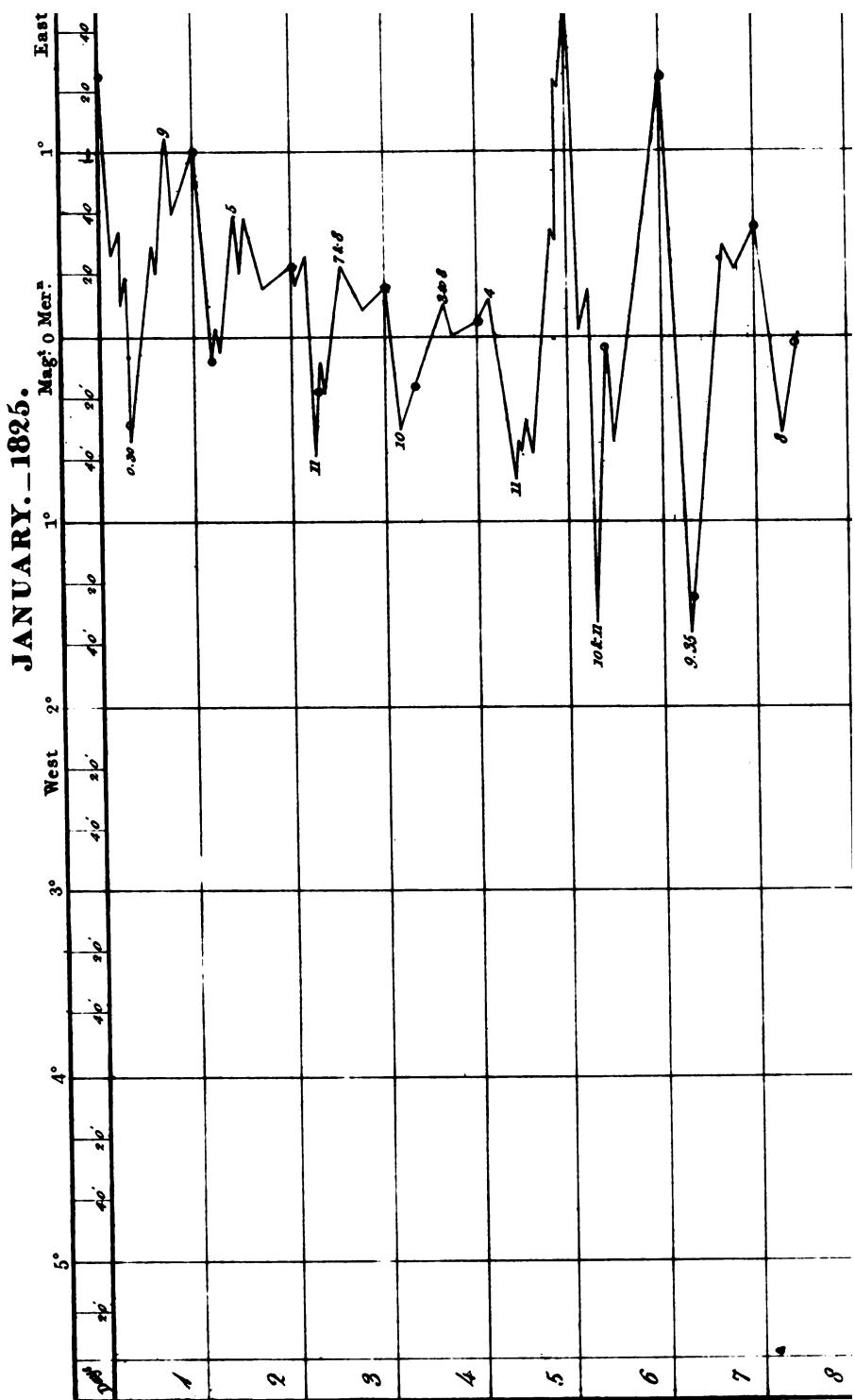


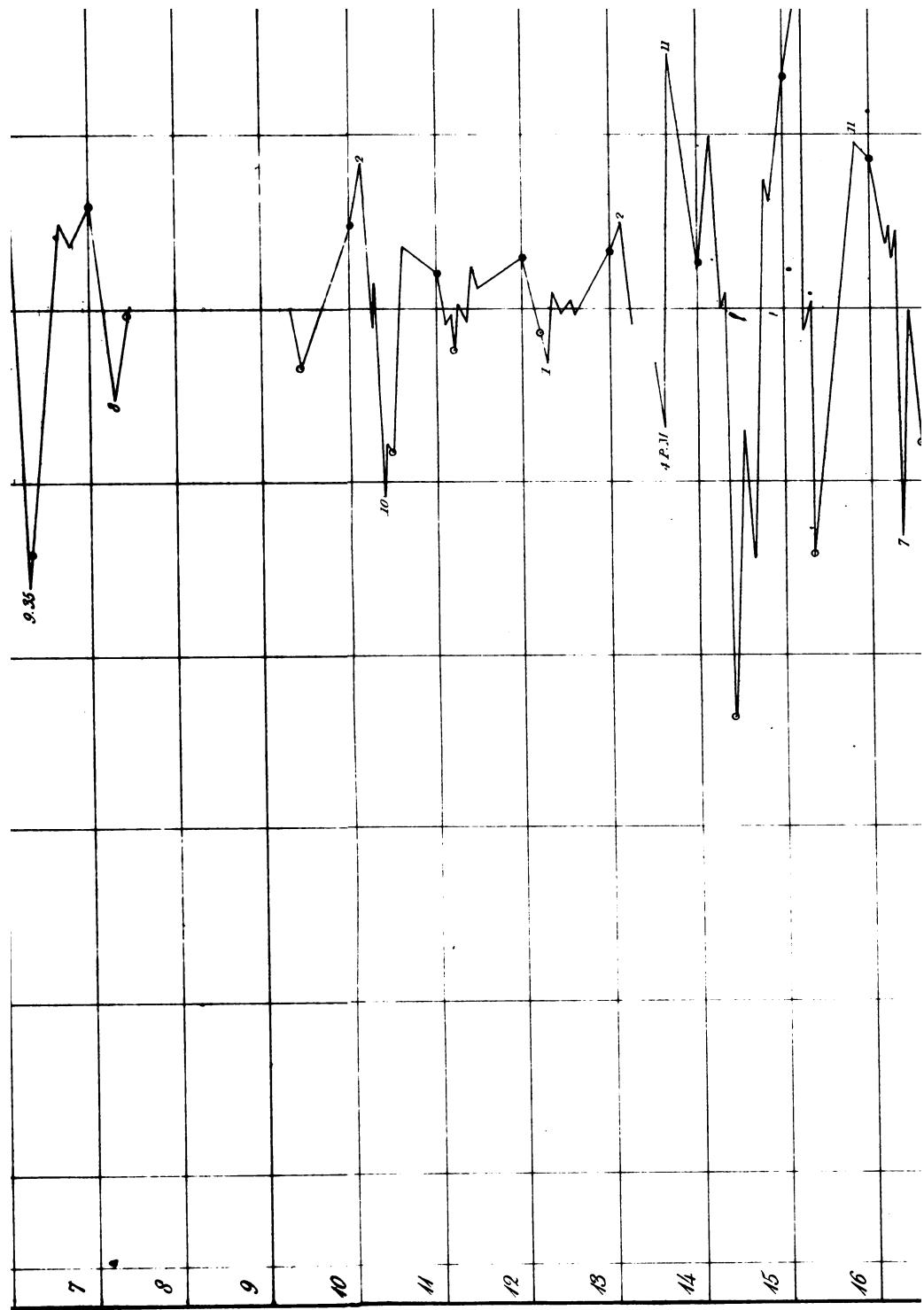


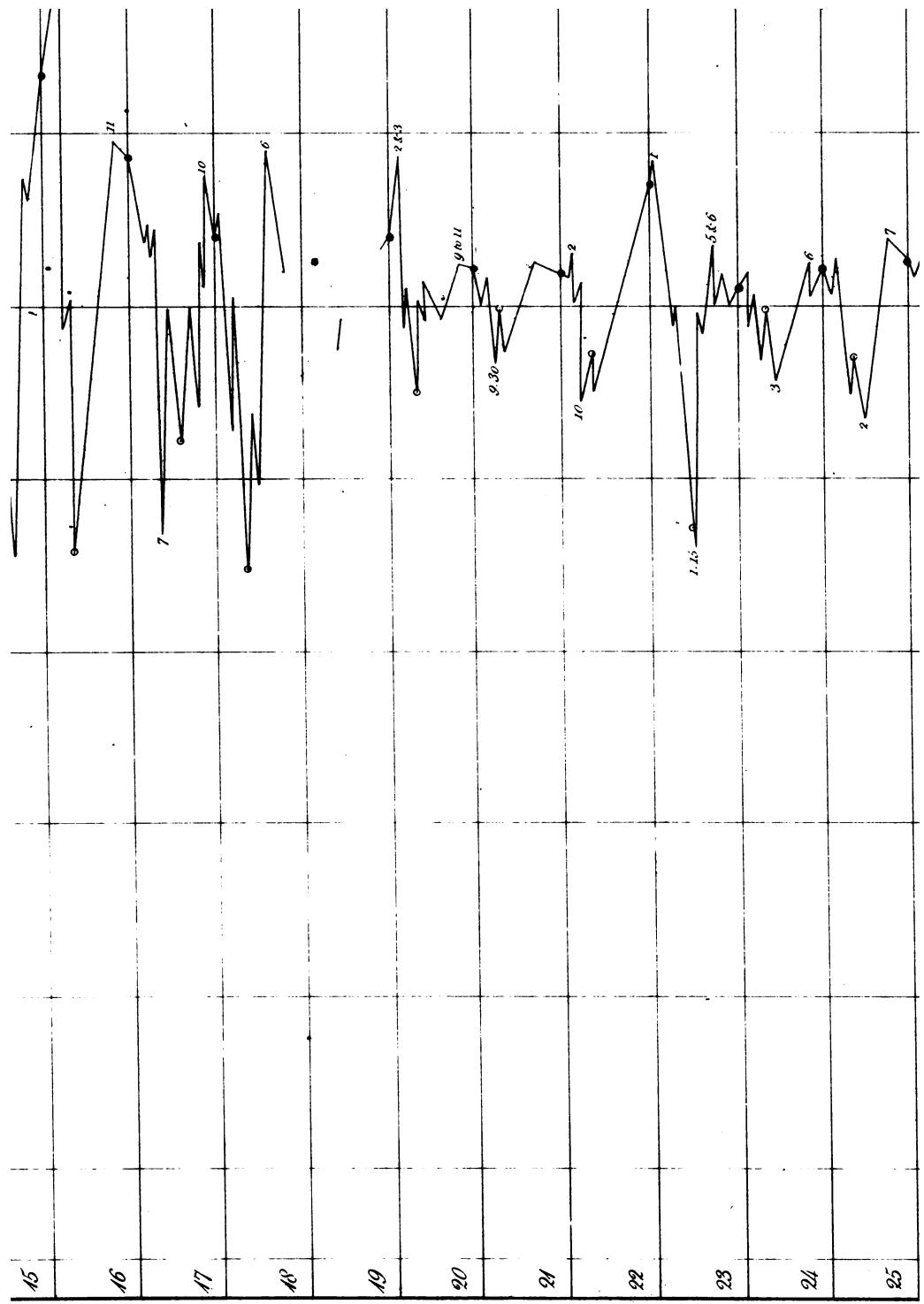


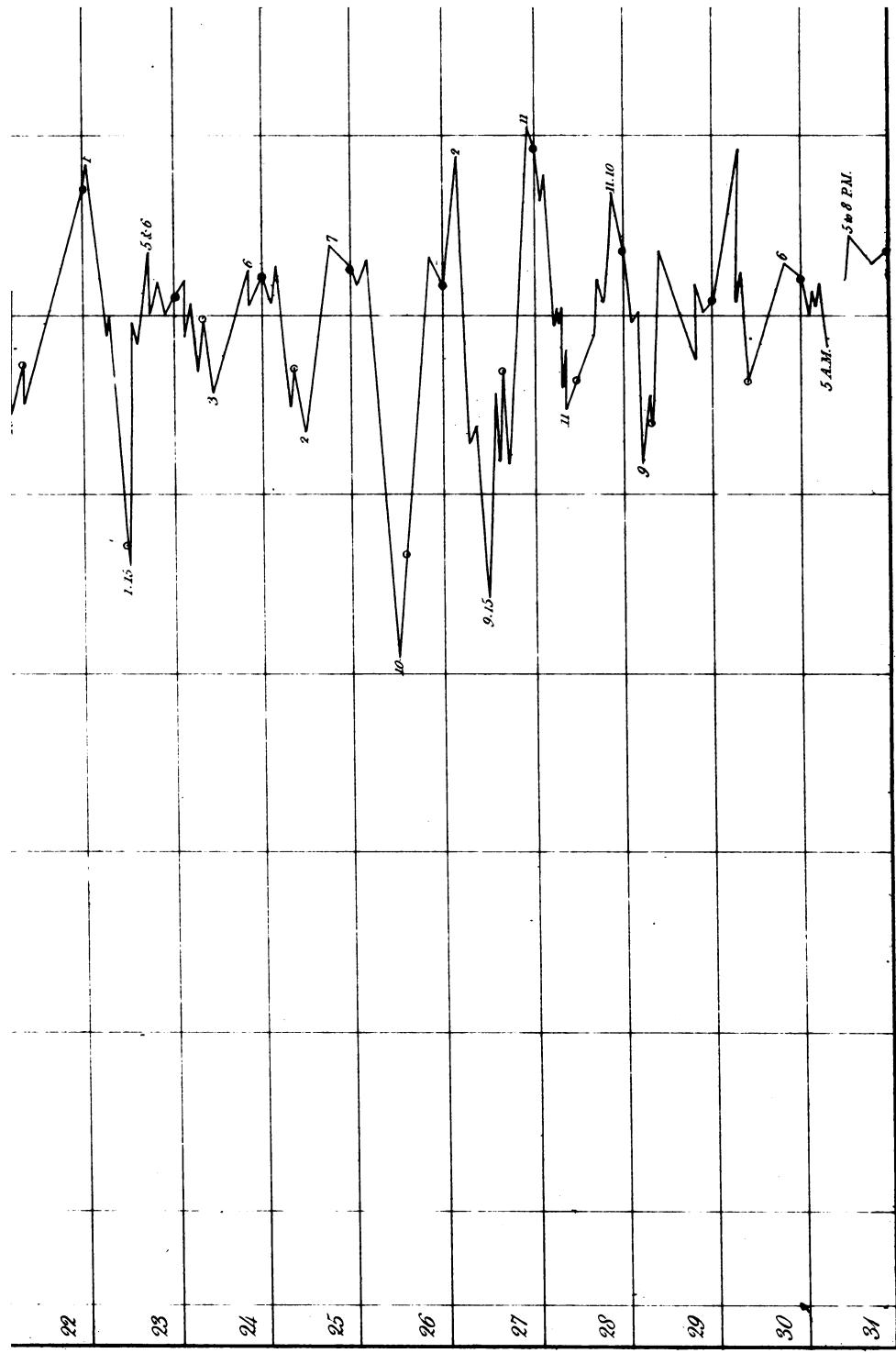
J. Baur. 10

at the intervening figures, the intermediate hours:





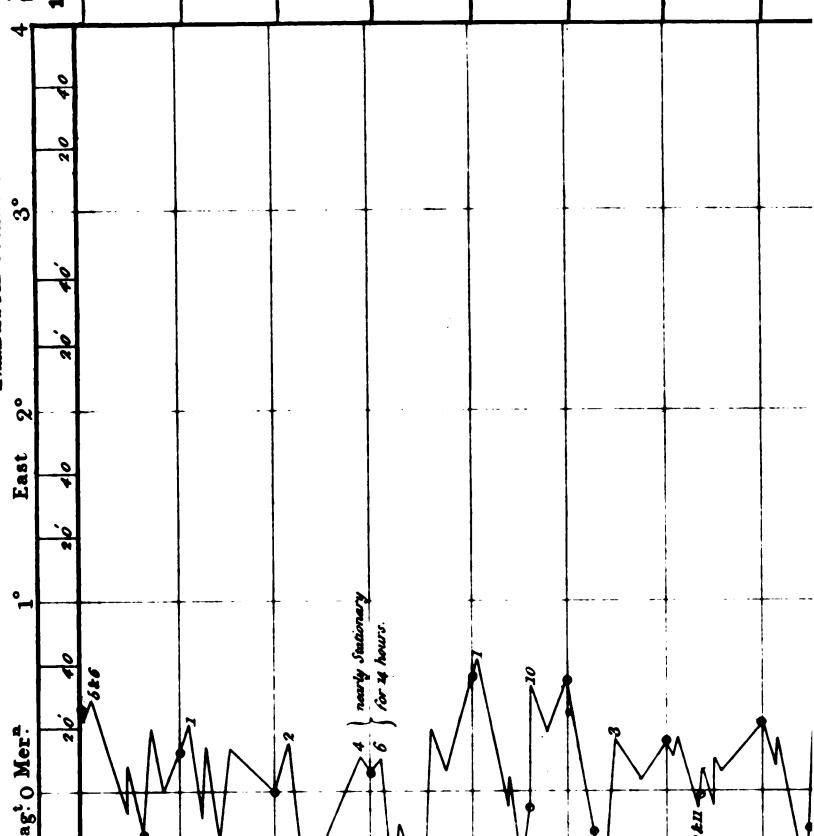




Note. The dark circular spots indicate Midnight; the light ones, Noon; and the intervening figures, the intermedia

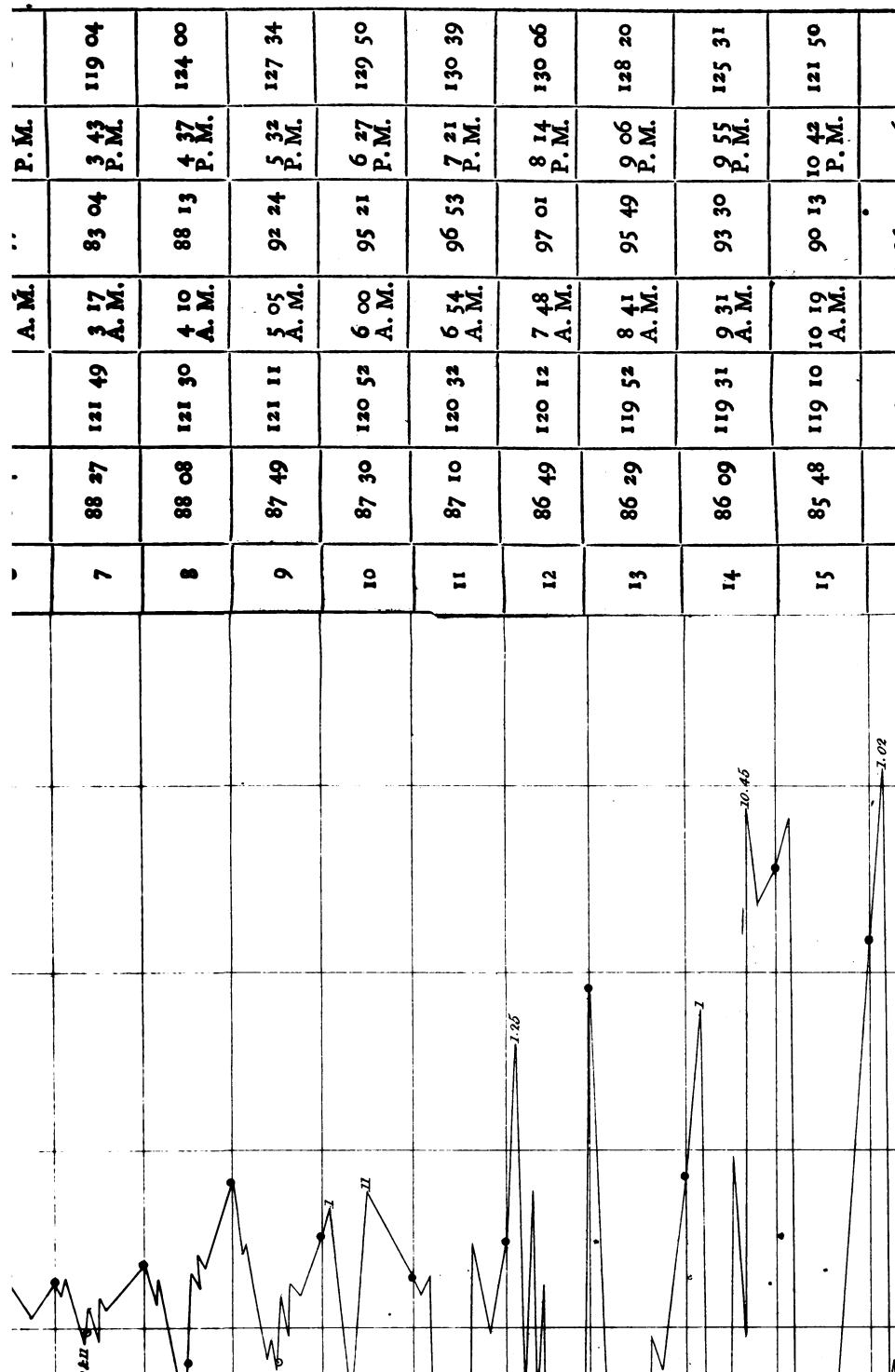
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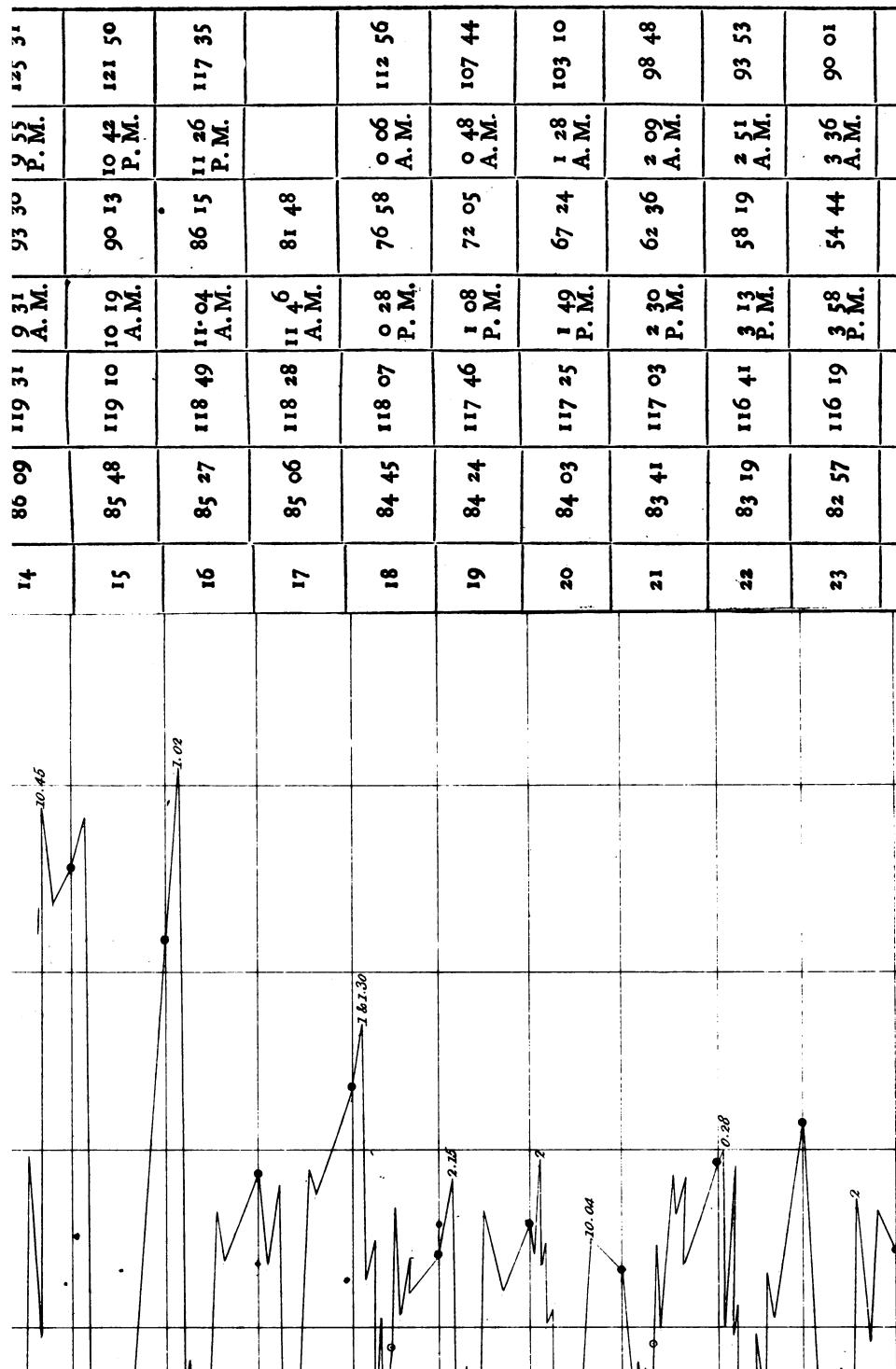
Phil. Trans. MDCCCLXV. Plate II. Part IV.

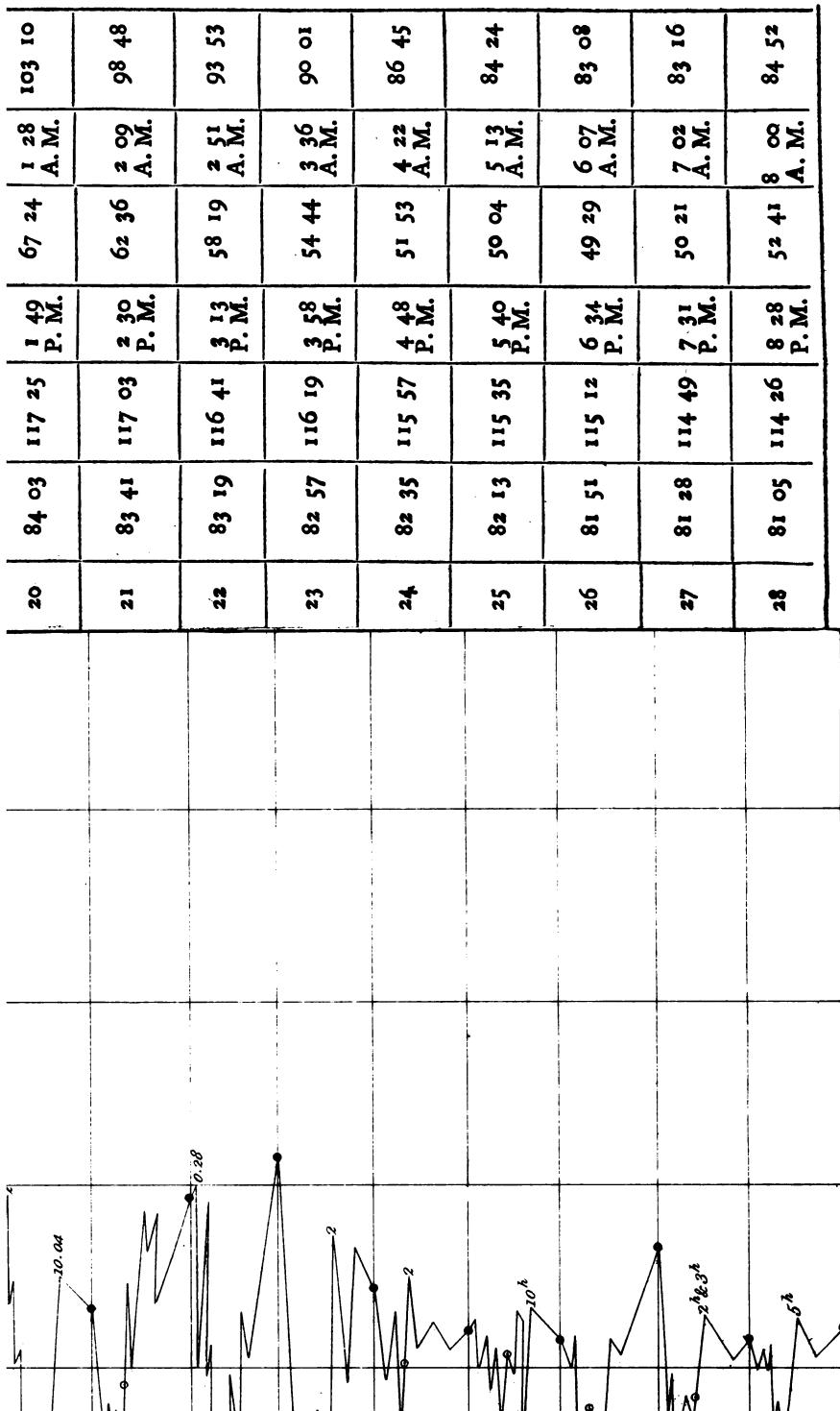


Needle I.

Century 1805.	Sun's Zenith Distance.		Moon on the South Meridian.		Moon on the North Meridian.	
	On the S. Meridian.	On the N. Meridian.	Time of passing.	Zenith distance.	Time of passing.	Zenith distance.
1	90 15	133 38	10 45 P.M.	0 43 A.M.	10 18 A.M.	86 06
2	89 58	133 21	11 43 P.M.	59 01 A.M.	11 14 A.M.	90 06
3	89 40	123 04			0 11 P.M.	95 13
4	89 22	122 45	0 38 A.M.	64 39 P.M.	1 05 P.M.	101 13
5	89 04	122 27	1 32 A.M.	70 48 P.M.	1 59 P.M.	107 31
6	88 46	122 08	2 25 A.M.	77 08 P.M.	2 51 P.M.	113 40
7	88 27	121 49	3 17 A.M.	83 04 P.M.	3 43 P.M.	119 04
8	88 08	121 10	4 10	88 12	4 37	124 00



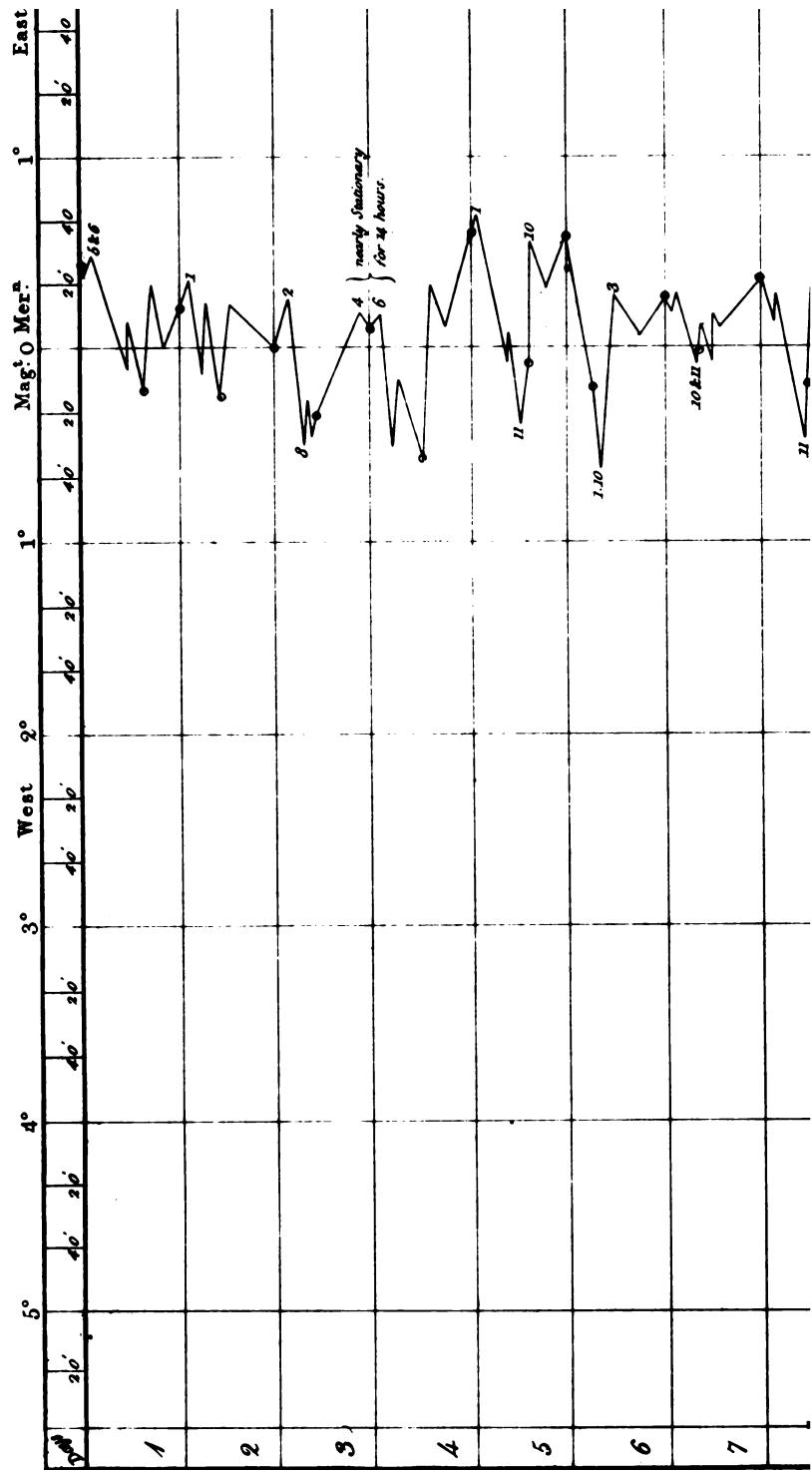


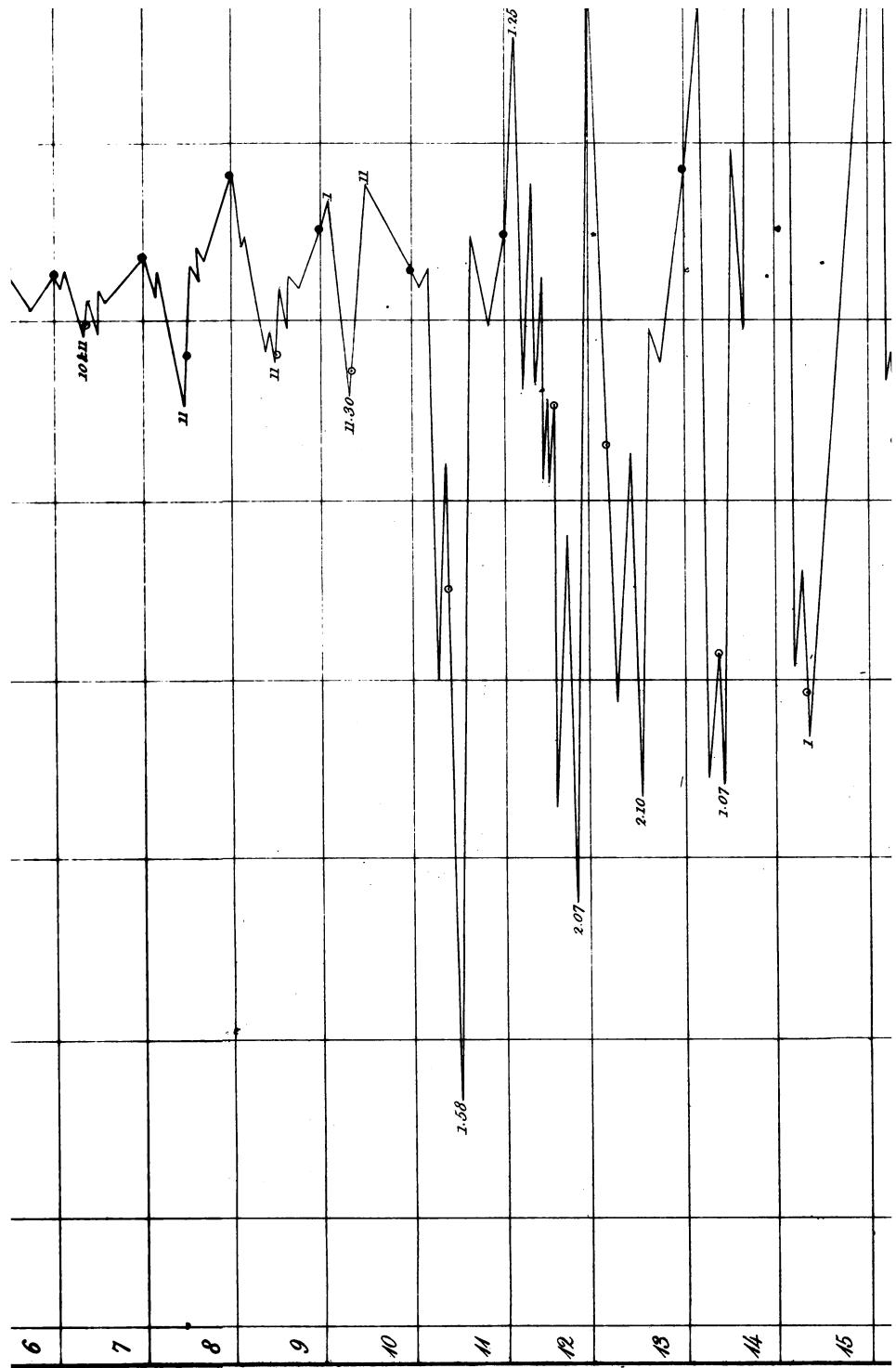


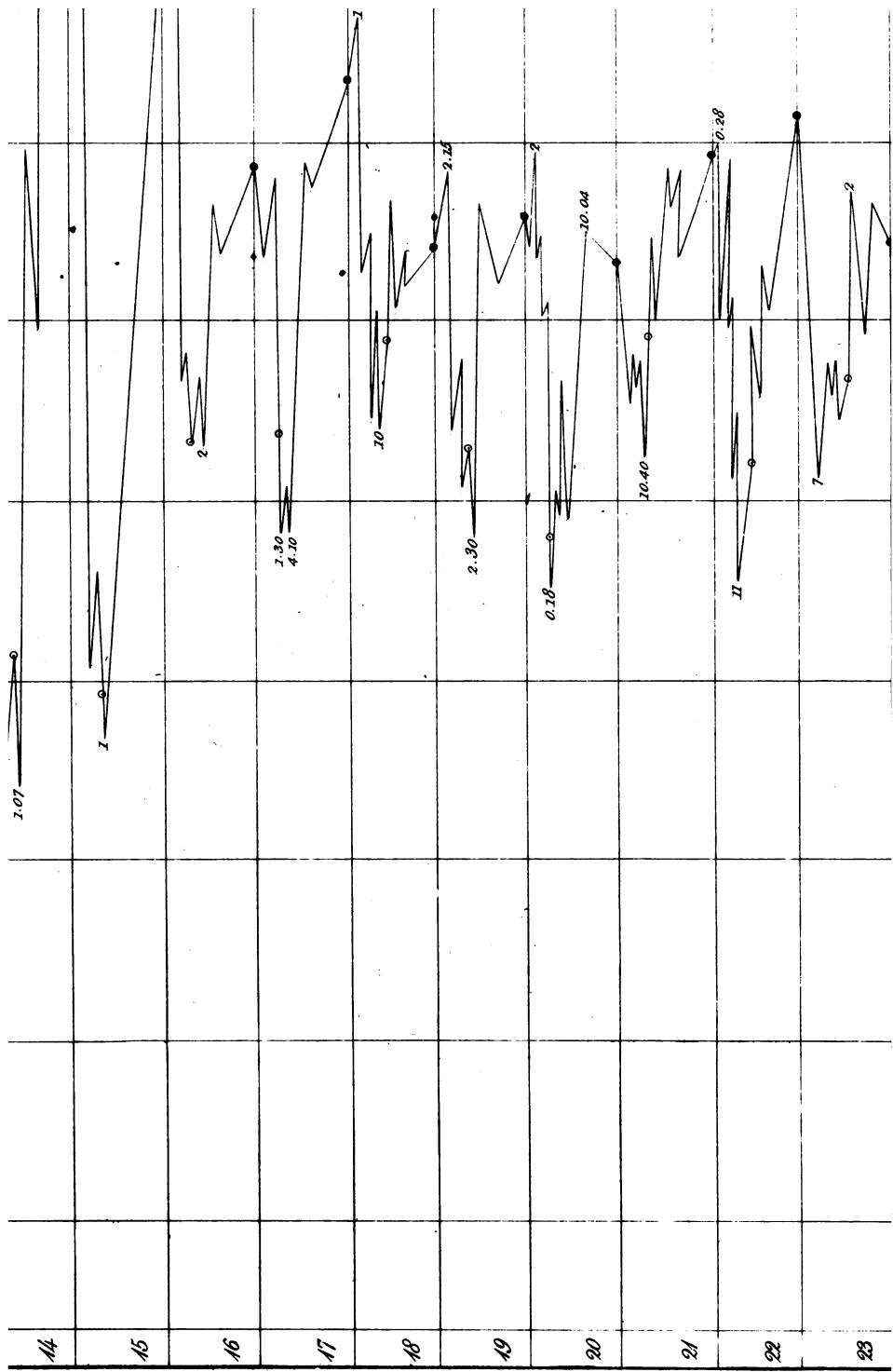
J. Barrie. 50

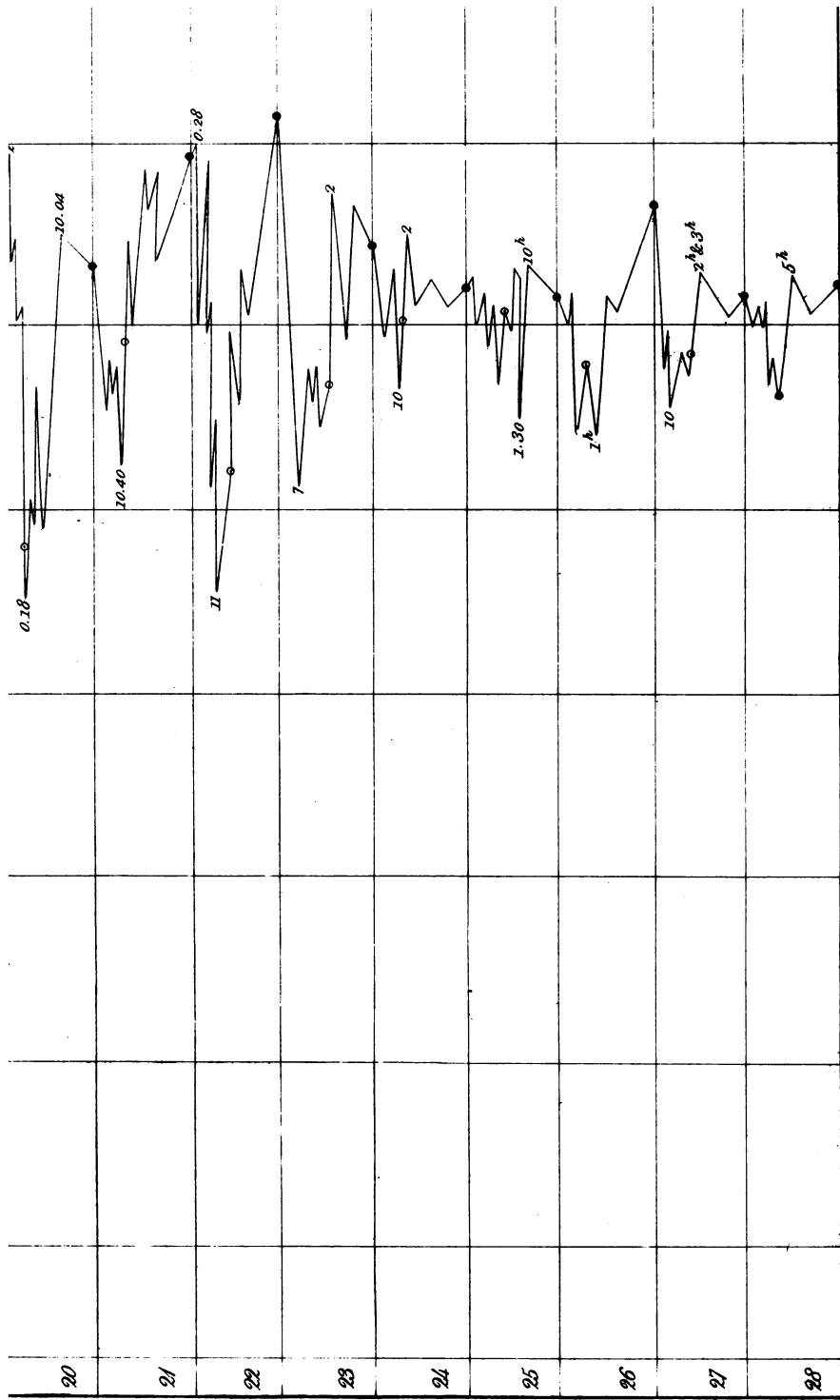
and the intervening figures, the intermediate hours.

FEbruary.—1825.



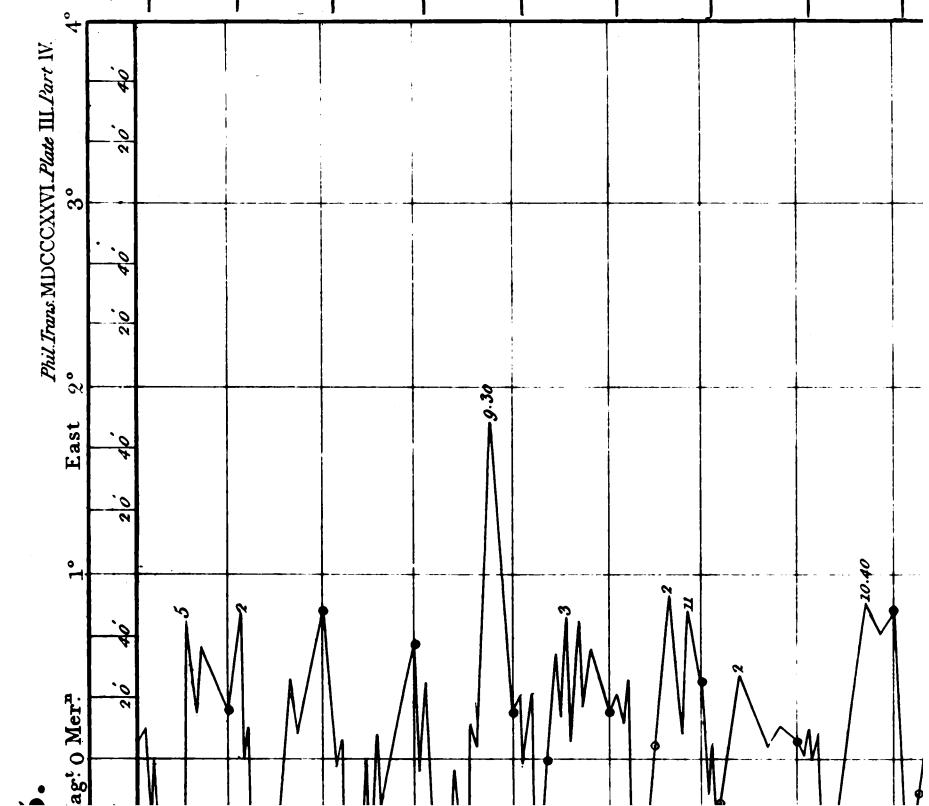




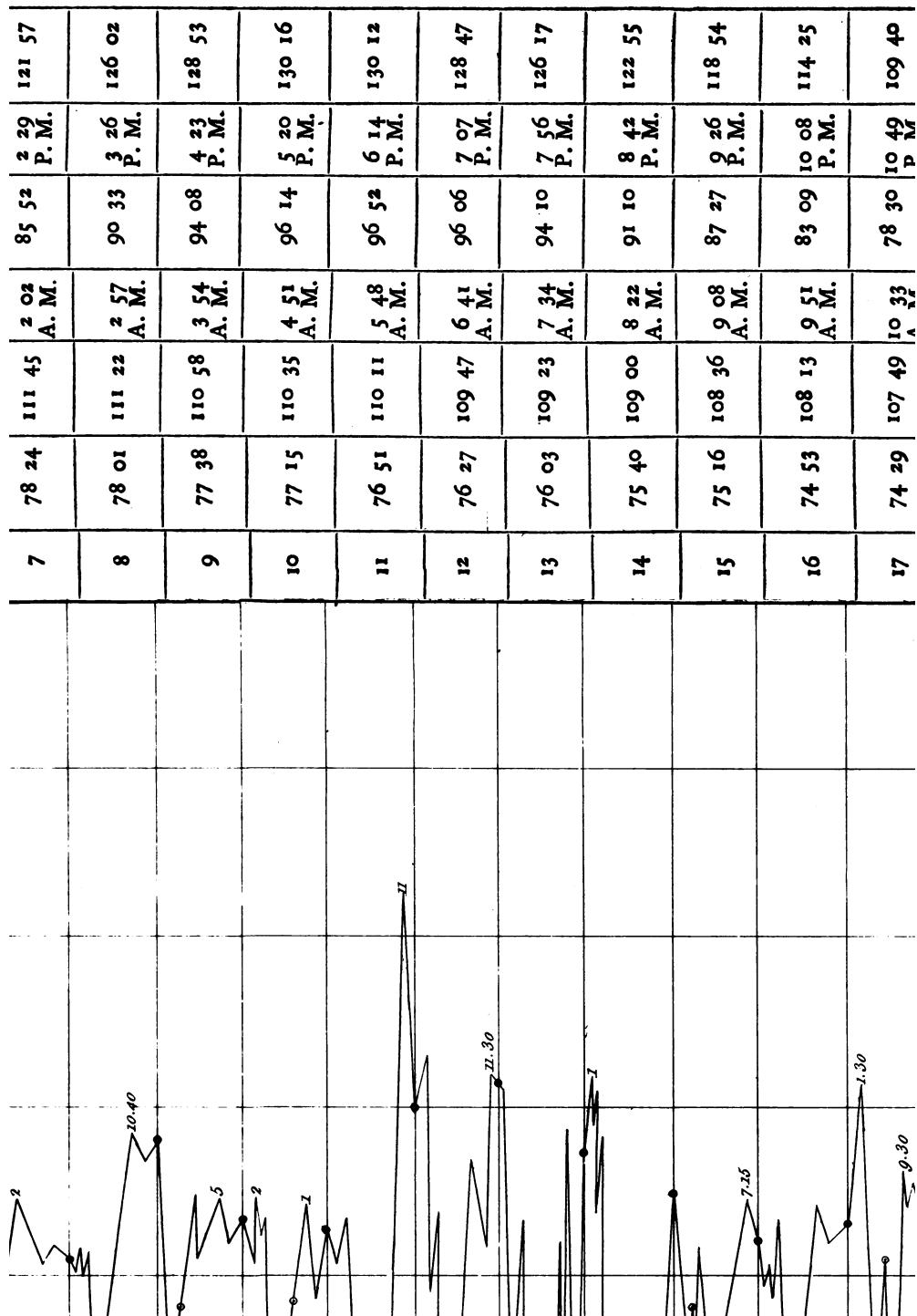


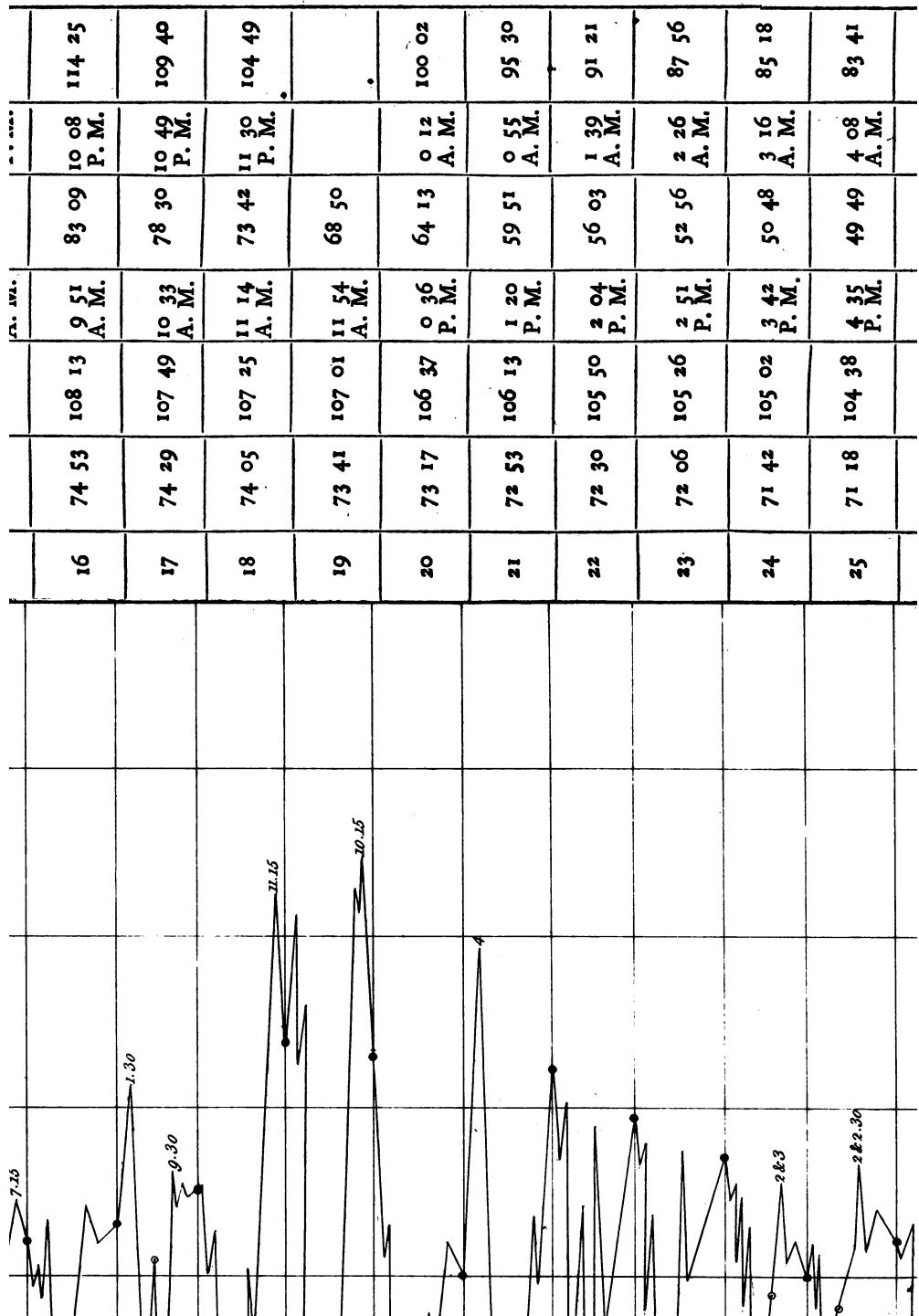
Note. The dark circular spots indicate Midnight; the light ones, Noon; and the intervening figures, the intermed.

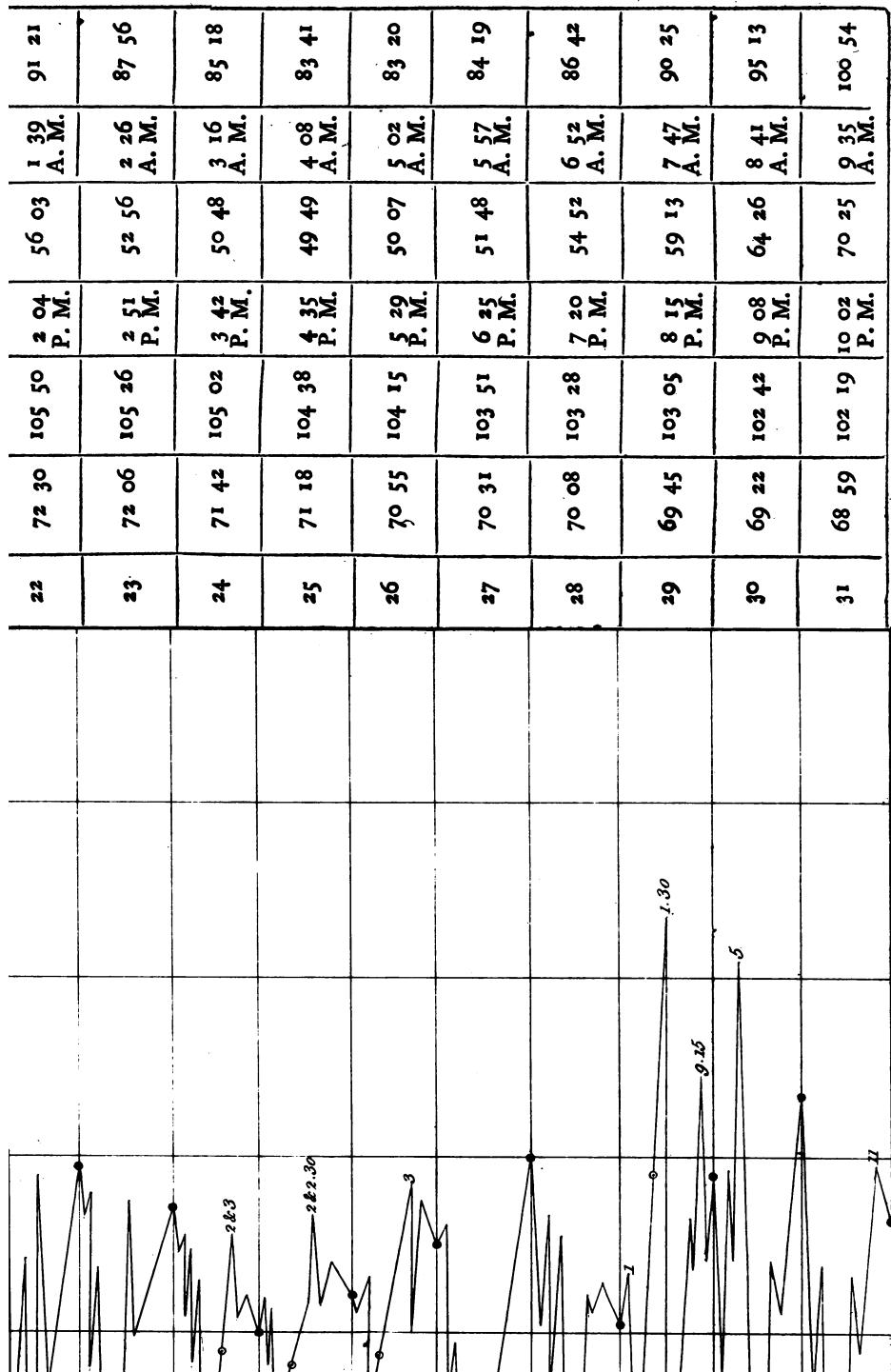
Needle I.



Date	Sun's Zenith Distance.			Moon on the South Meridian.			Moon on the North Meridian.		
	On the S. Meridian.	On the N. Meridian.	Time of passing.	On the S. Meridian.	On the N. Meridian.	Time of passing.	On the S. Meridian.	On the N. Meridian.	Time of passing.
1825.	°	°	h. m.	°	°	h. m.	°	°	'
1	80 42	114 03	P. M.	9 26	56 31	A. M.	8 58	87 56	
2	80 19	113 40	P. M.	10 22	61 31	A. M.	9 54	92 25	
3	79 56	113 17	P. M.	11 18	67 22	A. M.	10 50	97 53	
4	79 33	112 54				A. M.	11 44	104 03	
5	79 10	112 31		12 A. M.	73 41	P. M.	10 39	110 27	
6	78 47	112 08		1 A. M.	80 01	P. M.	1 34	116 34	
7	78 24	111 45		2 A. M.	85 52	P. M.	2 29	121 57	
8	78 01	111 22		2 A. M.	90 33	P. M.	3 26	126 02	



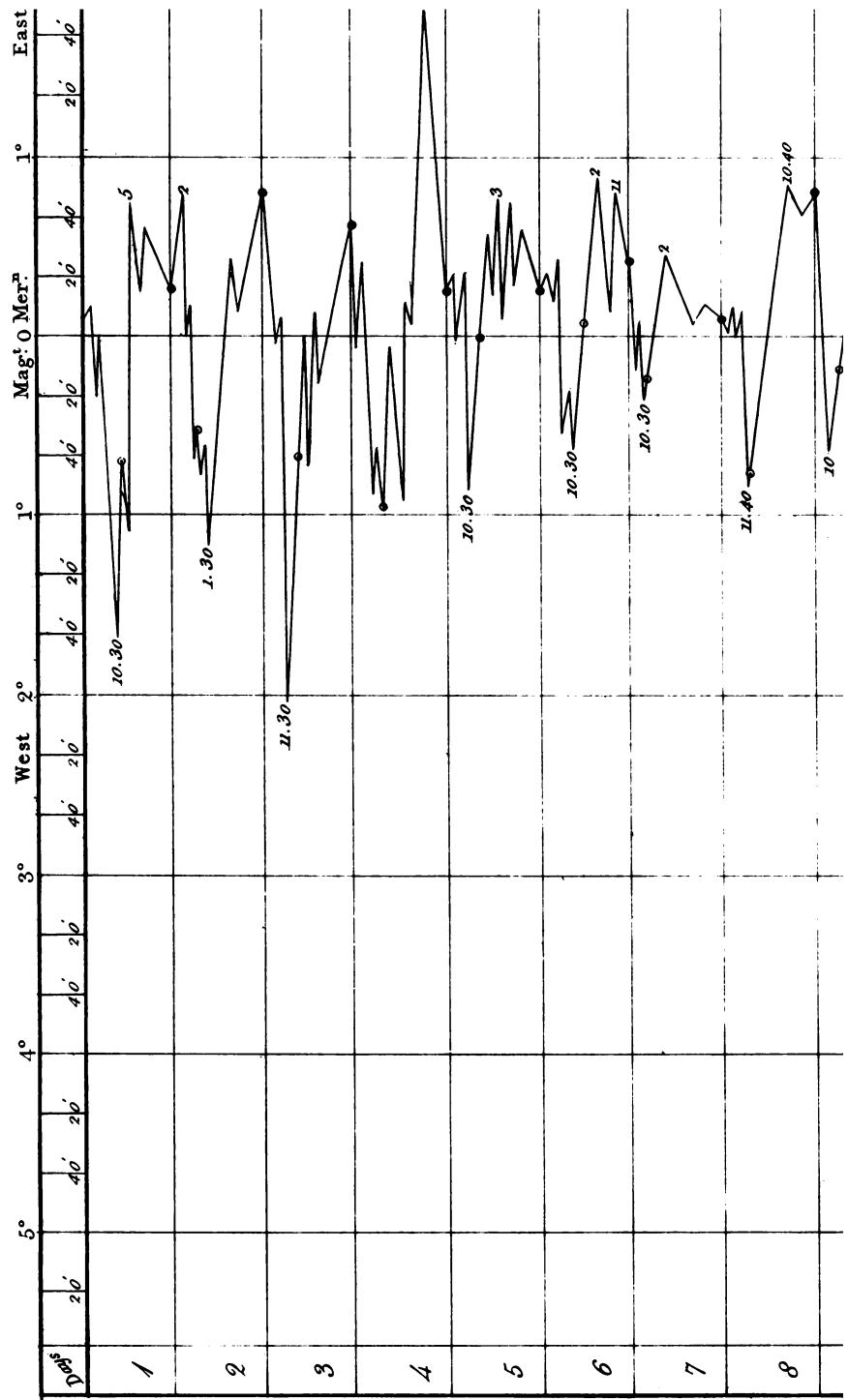


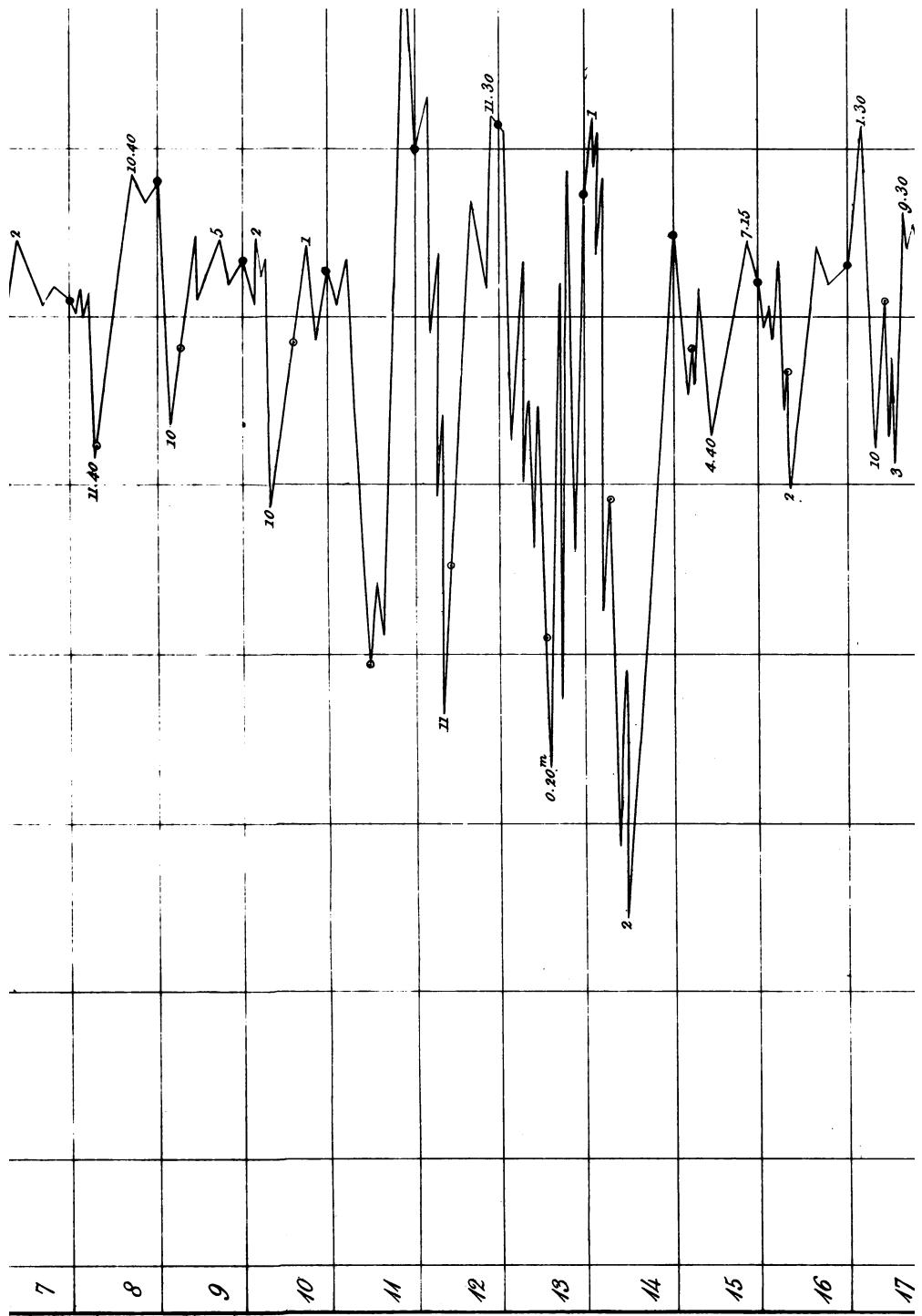


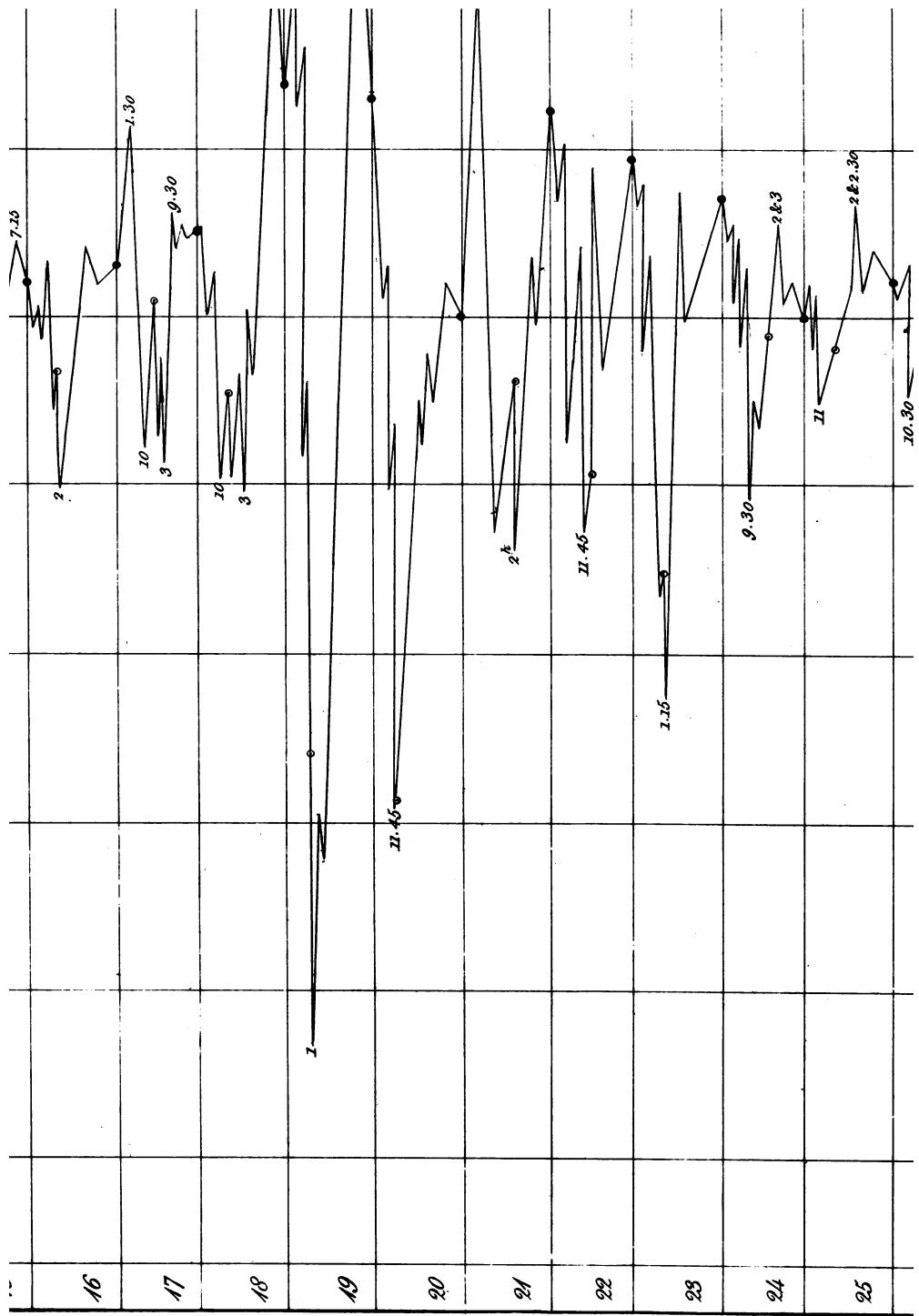
St. Barrie, 10.

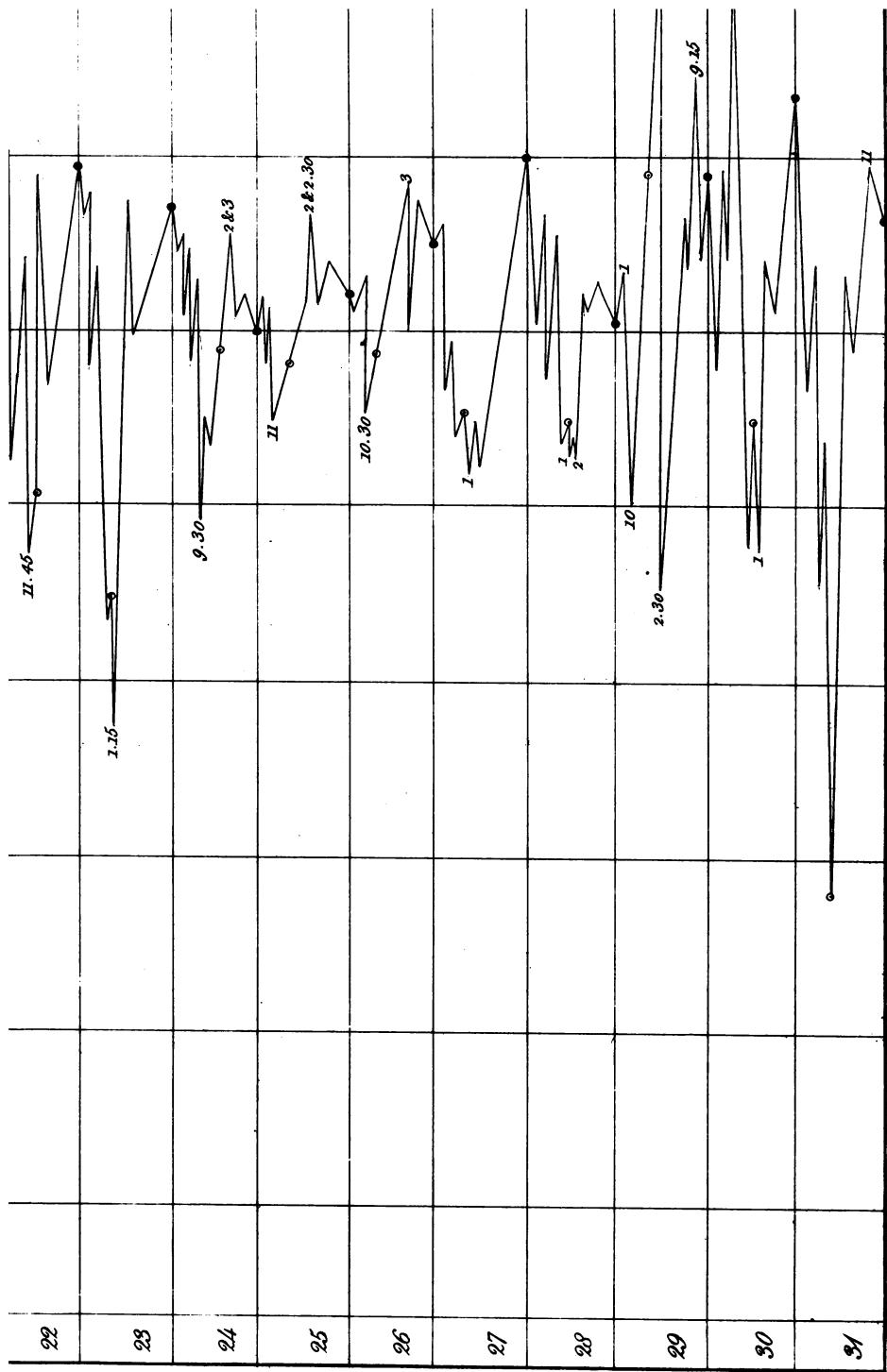
at the intervening figures, the intermediate hours.

MARCH. — 1825.









Note, The dark circular spots indicate *Midnight*; the light ones *Noon*; and the intervening figures, the *intervening*

left hand, or towards the magnetic meridian ; from whence it is inferred, that these contrary effects balance each other at S. 85° W. and produce what has hitherto been termed the line of minimum daily variation. Nevertheless it is a singular coincidence, that the *true bearing* of this line at Port Bowen (viz. S. $38^{\circ} 4'$ E.) agrees nearly with Mr. BARLOW's determination at Woolwich. It would, however, be desirable to have other observations, at places differing much in magnetic position, before drawing any conclusions as to the probability of its dependance on some general cause ; especially, since the needle after remaining absolutely stationary for three successive days at S. 85° W., commenced moving with its north end towards the *left hand*, or west point of the compass, at half-past three P. M. on the 27th of March ; without any apparent cause whatever, and that it did not again become stationary during the rest of the observations at this point, which were continued until the 5th of April ; in the course of which, as will be seen, its north end sometimes proceeded towards the *left*, and at others towards the *right hand*, during the time of westerly daily variation.

Whether this movement of the needle, on the 27th of March, took place in consequence of the changes of intensity in the opposing magnets (which were covered with snow), arising from the effects of temperature, or from the sudden variations of intensity of the horizontal needle which take place in short intervals of time, to which, I am most disposed to attribute it, is difficult to decide ; it was not considered to be due to the effects of electricity, as there was no appearance of the Aurora * at the time, nor was

* The Aurora generally appeared about north by compass, extending in an arch

the existence of that phenomenon, in the atmosphere, detected by the electrometer.

Towards the end of May, however, I commenced another set of observations (at S. 85° W.), but the needle never became stationary throughout their continuance ; its north end sometimes proceeding towards the north, at others towards the south, during the time of westerly daily variation, and that occasionally the needle was observed to vibrate in small arcs, as already noticed at its other azimuthal positions.

It will also be seen, on looking over the preceding observations, that the times of maximum westerly, and easterly daily variation, by this needle, differ on many occasions very considerably from those by the suspended needle : this difference it may be observed, arises from the circumstance of the observations on each needle not being made simultaneously, as well as from the minuteness of some of the phenomena escaping observation by the suspended needle ; but which were elicited by this needle, proportionally to its reduced directive force. Besides these observations on the daily changes of the horizontal needle, I also attempted a similar set on the dipping needle, but the difficulty of adjusting the magnets was such, as to prevent me from obtaining any satisfactory results.

Port Bowen, July 1st, 1825.

from about N. E. to N. W. at an elevation of from 10 to 20 degrees, with streamers sometimes shooting towards the zenith. At times when it was brightest, although not very brilliant during any part of the winter, I have frequently watched this needle, without ever being able to detect a change, that could be ascribed to its influence.